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ABSTRACT

This curriculum guide is designed to assist junior high school industrial arts teachers in planning new courses and revising existing courses in manufacturing technology. Addressed in the individual units of the guide are the following topics: introduction to manufacturing, materials processing, personnel management, production management, entrepreneurship, and computer applications in manufacturing. Each unit contains some or all of the following: objectives, key words, a list of teaching aids needed, suggested references, a sentence outline, a list of materials for students, suggested student activities, student worksheets, transparency masters, student handouts, and a unit test. Appendixes to the guide include a reference list; a list of material and equipment suppliers; and a series of computer programs dealing with conversion of various units of measurement, graphics applications, and shop accounting procedures. (MN)

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Manufacturing Technology

By

James L. Barnes

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Foreword

This publication is one of the new series of instructional materials for industrial arts education. It is designed to assist teachers as they plan and implement new courses of study and make revisions and improvements in existing courses. This publication is intended to help industrial arts teachers create learning environments that respond to the needs of students growing up in a complex industrial-technical society. It provides a framework that enables teachers to integrate classroom learning with real-life experiences of students.

Industrial arts is being challenged to expand and clarify its function. To meet this challenge, the industrial arts curriculum must provide opportunities for students to learn more about the technological realities in our society. This publication provides teachers with an instructional platform that focuses on industrial arts' commitment to establish its content base in the technologies.

Every effort has been made to produce a publication that addresses the unique needs of our current student population. Students with limited English proficiency (LEP) as well as handicapped, educationally disadvantaged, and nontraditional students may require modification of the material in this publication. The professional staff of EIMC will gladly work with any instructor having these students to show how the instructional material can be adapted for specific individualized instruction. Consult local, state, and federal agencies that offer assistance and guidance and that can provide sound recommendations for productive classroom management.

Kathryn R. Allen, Ph.D.
Acting Director, Extension Instruction
and Materials Center

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J. L. B.

Notes to the Teacher

Using the Curriculum Material

Intended Audience. The material in this curriculum package is designed for use by junior high/middle school industrial arts teachers in exploratory/introductory programs.

Length of Time for the Material. The topic of study has been developed to provide enough material for eighteen weeks of study. Individuals who teach six-, nine-, or twelve-week classes can select parts of this curriculum material as the substance of their classes.

Emphasis of the Material. Keep in mind that this curriculum material is exploratory in nature. The emphasis is on exposing students to a wide range of experiences within the topic of study rather than on the development of technical expertise in one area.

Benefits for Teachers and Students. This material is designed to assist industrial arts teachers in the classroom as they reinforce and enhance students' skills in reading, mathematics, communications, problem solving, and social interaction. In addition, teachers who use this curriculum material will be able to help their students gain an understanding of and appreciation for management and work skills needed by individuals in the world of work. The broad exposure students receive in the topic study will assist them in making meaningful career choices.

Flexibility of the Material. This curriculum material, like any other material, cannot encompass all situations. Therefore, teachers should feel free to supplement the material with other ideas, information, or activities as needed in their particular programs.

This material can be used in a number of different ways by industrial arts teachers. Some teachers may desire to use it as the starting point, a foundation upon which to build their own courses of study. Other teachers may prefer to teach the material as it is and add to it as they feel the need. Still other teachers may pick and choose only selected parts of this curriculum for use in their classes.

Teachers may also need to make substitutions in the curriculum depending on the equipment or references available. Other circumstances may also require teachers to make curriculum substitutions. The flexibility of this material enables teachers to use it in various ways and under various conditions. This curriculum provides teachers with an alternative in course design.

Competencies. Competencies have been identified for the topic of study. As used in this material, competencies represent skills, knowledge, or attitudes that imply the ability or intelligence to accomplish a task or job. They represent the instructional intent and are stated as specific goals to be achieved. Competencies assist teachers and students in clearly formulating a purpose for learning.

Organization of the Curriculum Material

The material in this topic of study is organized into instructional units. The framework used to develop each unit consists of a number of components. These components focus on (1) outcomes, (2) materials, (3) content, (4) activities, and (5) evaluation. The components are further divided and standardized in each topic of study. An explanation of each part in the instructional unit follows.

Objectives. Objectives have been identified for each instructional unit. The objectives reflect the kind of performance necessary to successfully complete a task or job. These objectives enable a student to attain the stated competencies. Furthermore, each unit's objectives are reflected in the content, student activities, and tests for that unit.

Objectives help the teacher and the student to focus upon the important concepts to be learned in each unit. Teachers may want to duplicate the competencies and objectives and give them as handouts to the students.

Key Words: Vocabulary. New words or terms are listed to enable you to help students develop their vocabulary. Some words or terms may be listed in several units because they are used throughout a topic of study. The repetition helps reinforce vocabulary building. A student vocabulary worksheet has been included with each unit.

Teaching Aids. The materials, equipment, and supplies identified in this section will enable the teacher to plan and organize instruction better. Teachers need to review this list of teaching aids before the day of instruction since some substitutions in equipment may be needed under certain conditions. A test key has been included to help the teacher in correcting the unit test.

Each transparency in this unit is also listed and briefly described. Transparency masters are provided at the end of each unit. The transparencies are keyed to a point in the sentence outline where their use is considered most appropriate. In addition to being used as transparencies, the masters may be duplicated and used as student handouts if the teacher so desires. Teachers may design or develop other transparency material that they feel enhances their instruction.

Suggested References. Many of the publications listed are available from textbook publishers. However, the reading level of these textbooks is often above junior high/middle school grade level. The material listed in this section is suggested for use by teachers as a way to supplement their knowledge in the subject area. Teachers can review these references and use selected material as supplements to their lectures and demonstrations when appropriate. Some of the sources suggested offer free or inexpensive materials that teachers may use with their students.

Sentence Outline. The information presented in this section represents the conceptual focus of the unit. The ideas and concepts are presented in a sentence outline, as a guide from which to teach. The outline should serve as a reference from which teachers can provide instruction.

The intent was not to needlessly duplicate material that is readily available to teachers. Rather, the intent was to provide teachers with basic ideas and information that may be less accessible. The suggested references and other resources can be used by teachers to build a knowledge base from which they can synthesize relevant concepts and information. Suggested references can be used to supplement, expand, and clarify learning activities and instruction.

Materials for Students. Suggestions to teachers regarding student materials may also be listed here. Student handout materials, such as exercises, charts, and graphs, are provided at the end of each unit when appropriate These student handouts immediately follow the suggested student activities section. Handout materials may be reproduced and given to students.

Suggested Student Activities. The suggested activities are designed to reinforce and provide real applications of the concepts and content within each unit. These activities have been designed to use existing facilities and equipment, as much as possible. Another consideration was the cost factor. Suggested activities are designed to require minimum cost.

Each teacher should, therefore, examine the activities and select those which are appropriate for their students. Teachers can change or modify the suggested activities if equipment, materials, and funds are not available. Teachers need to be selective in the activities they use since some activities take longer than others. Some are designed for group activity while others are for individual work. The teacher's content emphasis must also be considered. Each of the activities has been designed to reinforce and enhance basic skills that students need in everyday life.

Tests. Each unit has a multiple-choice test to assist teachers in evaluating student achievement. Multiple-choice tests provide certain advantages for teachers in evaluating the teaching-learning process. They do not capitalize on chance answers to the extent that true-false tests do. Careful development of test answers will help teachers evaluate a student's comprehension of important concepts. This also provides teachers with an easy way to assess the effectiveness of their instruction through item analysis.

Written tests are only one method of assessing learning. Teachers will also need to evaluate a student on actual performance in each activity, on abilities, and on general progress toward reaching objectives. Each teacher should develop an evaluation system that provides the most accurate assessment of a student's progress.

Teachers may prefer to develop their own test instruments. However, their test items should focus upon objectives and course content. The test for each instructional unit in this curriculum material does focus on the objectives stated at the beginning of each unit and on unit content. A test key is also provided in the teaching aids section of each unit for the teacher's use in correcting tests.

Essential Elements

I. Essential Elements Common to All Vocational Education Programs
   A. Leadership concepts and skills
      The student shall be provided opportunities to—
      1. identify characteristics and responsibilities of leaders and effective group members;
      2. participate in orderly meetings conducted according to parliamentary procedure;
      3. function effectively on committees;
      4. plan and conduct leadership activities; and
      5. prepare for effective citizenship and participation in our democratic society.
   B. Concepts and skills related to successful employment
      The student shall be provided opportunities to—
      1. develop an awareness of employment opportunities in a chosen field;
      2. practice correct procedures for job application and interview;
      3. develop the ability to take and follow both oral and written directions;
      4. practice punctuality and dependability;
      5. observe rules and standards of the workplace;
      6. demonstrate an ability to work with others harmoniously;
      7. develop responsibility and the ability to follow through on assigned tasks; and
      8. exhibit productive work habits and attitudes.
   C. Concepts and skills associated with entrepreneurship
      The student shall be provided opportunities to—
      1. recognize opportunities and options for business ownership;
      2. identify entry-level procedures, planning processes, and terms needed to open a business; and
      3. develop an understanding of the role of small business in the free enterprise system.

II. Essential Elements Common to All Industrial Arts Programs
   A. Concepts and skills in the application of safety procedures
      The student shall be provided opportunities to—
      1. demonstrate safe operation and use of selected tools and equipment to avoid injury; and
      2. maintain safe conditions in the laboratory.
   B. Concepts and skills related to planning, designing, and problem solving
      The student shall be provided opportunities to—
      1. plan and design industrial products of the student's choice;
      2. measure accurately using metric and customary units;
      3. complete itemized list of materials; and
      4. make working drawings of projects.
   C. Concepts and skills related to the tools, materials, and process of technology
      The student shall be provided opportunities to—
      1. solve industrial problems by using a variety of industrial materials;
      2. use correctly selected hand and machine tools; and
      3. select the most suitable process to complete a project.
   D. Concepts and skills related to the past, present, and future of technology
      The student shall be provided opportunities to—
      1. recognize ideas and inventions of the past and present; and
      2. relate technological change to the skills needed for the future.

E. Concepts and skills related to evaluating products and services of technology
The student shall be provided opportunities to—
1. recognize good design and construction;
2. evaluate products based on given standards or applications;
3. service industrial products and equipment; and
4. develop criteria for selecting, purchasing, and contracting services.

III. Concepts and Skills Related to Production Technology
The student shall be provided opportunities to—
A. apply industrial organization and management systems by planning, organizing, and controlling production processes;
B. apply primary industrial processes of layout, testing, separating and cutting, drilling and boring, shaping and forming, casting, laminating, coating, decorating, joining, and finishing;
C. research the recycling of industrial materials;
D. plan and implement the various steps in the construction process;
E. research the transformation of raw materials into finished products;
F. plan and implement mass production activities;
G. demonstrate techniques and processes used in automated production systems; and
H. use computers in planning, production, quality control, and management of production systems.

IV. Concepts and Skills Related to Production Technology in the Area of Manufacturing
The student shall be provided opportunities to—
A. participate in activities involving product researching, designing, and marketing;
B. investigate financial resources needed in industrial production;
C. plan and implement mass production activities;
D. apply industrial organization and management systems by planning, organizing, and controlling production processes;
E. develop production charts and graphs;
F. demonstrate an awareness of automated systems used in manufacturing;
G. recognize basic material standards and terminology used in industry;
H. apply the basic industrial processes to manufacturing;
I. research the recycling of manufactured materials; and
J. use computers in planning, production, quality control, and management of production systems.

Competencies for Manufacturing

Concepts and skills related to production technology

- Explore industrial organization and management systems by planning, organizing, and controlling production processes.
- Apply principles of production management.
- Apply primary industrial processes of designing, layout, cutting, drilling and boring, shaping, jointing, fastening, and finishing.
- Explore the processes used in testing, forming, shaping, laminating, coating, decorating, and recycling materials.
- Select materials most appropriate to the production of industrial products.
- Research the transformation of raw materials into finished products.
- Plan and implement mass production activities.
- Explore techniques and processes used in automated production systems.
- Demonstrate the use of computers and robots in production systems.
- Participate in activities involving product researching, designing, processing, marketing, and servicing.
- Investigate financial resources needed in industrial production.
- Select, handle, purchase, recycle, store, and retrieve industrial materials.
- Use basic tools and equipment common to manufacturing technology.
- Explore the use of personnel management systems used in mass production.
- Develop an assembly line flow chart.
- Develop an awareness of automated systems used in manufacturing.
- Recognize basic material standards and terminology used in industry.
- Study and discuss new industrial applications.
- Discuss future developments and expectations in manufacturing technology.

1

Introduction to Manufacturing

OBJECTIVES

After the students have covered the material in this unit, they should be able to—

1. tell why they should study manufacturing;
2. define manufacturing;
3. understand the impact of manufacturing on society; and
4. understand the importance of safety in manufacturing, and apply good safety practices and procedures in their work.

KEY WORDS: VOCABULARY

The words in the following list may be new to the student studying manufacturing. Teachers should help students understand these words as they are used in this topic of study.

technology
manufacturing
part-industrial society
information society
custom production
job-lot production
line production
protective equipment

TEACHING AIDS

- Overhead projector
- Appendices A and B
- Test Key: 1-A, 2-C, 3-B, 4-C, 5-A, 6-B
- Transparencies: You will find transparencies M1-1 through M1-7 at the end of this unit. If you wish, these masters may be duplicated in quantity and given as handouts to the students while they are studying the different aspects of this unit.
    - M1-1: Manufacturing Technology
    - M1-2: Impact of Manufacturing on Society
    - M1-3: What is Technology?
    - M1-4: Future Trends in Manufacturing
    - M1-5: Three Types of Production
    - M1-6: Manufacturing Safety
    - M1-7: Protective Equipment

SUGGESTED REFERENCES

Bame, E.A., and Cummings, P. *Exploring Technology*. Worchester, Mass.: Davis Publications, 1980.

Fales, James; Sheets, Everett; Mervich, Gregg; and Dinan, John. *Manufacturing: A Basic Text for Industrial Arts*. Bloomington, Ill.: McKnight Publishing Company, 1980.

Groneman, Chris H., and Grannis, Gary E. *Exploring the Industries*. Albany, N.Y.: Delmar Publishers, 1981.

Jambro, Donald J. *Introduction to Manufacturing*. Albany, N.Y.: Delmar Publishers, 1982.

Lux, Donald G., and Ray, Willis E. *World of Manufacturing*. Bloomington, Ill.: McKnight Publishing Company, 1971.

SENTENCE OUTLINE

I. Why study manufacturing?
   A. Manufacturing technology is the study of designing, planning, and building a product in one location, and distributing it to another location to market it. (Transparency M1-1)
   B. This study should develop a better understanding of the impact of manufacturing on society.
   C. In the last decade, the effects and influences of high technology have led to new design, fabricating, and production techniques and processes.
   D. Energy resource conservation and environmental controls and restraints have influenced the way we manufacture goods.

II. The impact of manufacturing on society (Transparency M1-2)
   A. With the invention of crude tools by primitive humans, technology was born.
   B. Technology is people using tools and techniques in their most efficient way. (Transparency M1-3)
   C. Products are manufactured to meet some human need.
   D. Manufacturing provides goods and services that make our lives easier and more enjoyable at home, at work, and at play.
   E. Environmental influences have greatly affected and changed methods, techniques, and processes of designing, fabricating, and producing goods and services.
   F. High technology systems have greatly influenced the way products are designed and built.
   G. Future trends will change the manufacturing industry. (Transparency M1-4)
      1. The changes in our society from an industrial society to a part-industrial, information society will have a great impact in manufacturing.
      2. A major problem facing the manufacturing industry in the future will be analyzing the type of jobs and training needed to produce goods and services in a high-technology, part-industrial society.
      3. Energy conservation and air pollution reduction will become more important in the manufacturing industry.
      4. Manufacturing materials are continually changing, and this will provide more flexibility in manufacturing design, fabrication, and production.

III. Types of production (Transparency M1-5)
   A. Custom production is one person or a group of people producing one kind of product or service, one at at time.
   B. In job-lot production, only a limited number of a specific product or service is manufactured.
   C. In line production, large quantities of a product or service are manufactured through automated processes, and the worker performs only one job continuously on that product or service.

IV. Manufacturing safety and technology (Transparency M1-6)
   A. An employee's health and safety is the most important consideration in the manufacturing industry.
   B. The manufacturing industry has many dangerous and hazardous jobs that could create potentially harmful conditions for employees.
   C. It is important that manufacturing companies provide proper safety training and awareness for their employees.
   D. The Occupational Safety and Health Act (OSHA) requires companies to provide a safe working environment and conditions for their employees. The Occupational Safety and Health Administration enforces and administers the provisions of the Act.

E. It is important that manufacturing employees use certain personal protective equipment while they work. (Transparency M1-7)
   1. Protective hard hat: This is worn to protect the worker from head injury due to falling objects.
   2. Eye protection devices: Safety glasses, goggles, and shields protect the eyes from flying objects and from welding arcs.
   3. Hearing protection devices: Earplugs and earmuffs protect the worker's ears from high levels of noise for long periods of time.
   4. Protective gloves: Gloves protect the worker's hands from blisters, burns, and cuts when handling rough materials and chemicals and from the heat and radiation of welding.
   5. Protective shoes: These specially designed shoes help prevent the worker's feet from being injured if heavy materials should fall on them.
   6. Respirators: Respirators protect the worker from breathing in hazardous fumes and dust particles.

MATERIALS FOR STUDENTS

- Vocabulary worksheets
- Newspapers and magazines for bulletin board ideas
- Pencils, paper, scissors, etc.

SUGGESTED STUDENT ACTIVITIES

1. Design and construct a bulletin board depicting manufacturing technology. Ask students to collect and bring in articles, pictures, and posters related to manufacturing technology.
   Transparency M1-1: Manufacturing Technology
   Transparency M1-2: What Is Technology?
2. Identify and discuss new technologies in the manufacturing industry. Ask students to look through newspapers and magazines and bring in articles on new technologies in the manufacturing industry.
   Transparency M1-3: Impact of Manufacturing on Society
   Transparency M1-4: Future Trends in Manufacturing
   Suggested ideas of new technologies in the manufacturing industry:
   - alternative energy and environmental controls
   - computer-aided manufacturing and robotics
   - future trends that will affect the construction industry
   - new equipment being used in the construction industry
3. Identify and discuss the three types of production, and have students give examples of each.
   Transparency M1-5: Three Types of Production
4. Have the students work in groups and conduct a safety inspection of the industrial arts facilities. Identify and discuss the findings of the inspection, then have the students make recommendations on what they think should be done to correct the problems.
   See the Industrial Arts Laboratory Safety Checklist
5. The students will organize and participate in a Safety Poster Contest sponsored by the local AIASA chapter and a local construction industry.
   Transparency M1-6: Manufacturing Safety
   Transparency M1-7: Protective Equipment

Suggested ideas for Safety Poster Contest:

- organize a Safety Poster Contest Committee to establish the rules for the contest. Then have the Committee contact the manufacturing company and tour several of their sites to determine the basic safety concerns and needs of the company. (If possible, videotape the tour.)
- Have the safety engineer or director of a manufacturing company speak to the class.
- Set up an awards and recognition program with the safety engineer or director of the company.

Vocabulary Worksheet

1. technology
2. manufacturing
3. part-industrial society
4. information society
5. custom production
6. job-lot production
7. line production
8. protective equipment

TEST

Unit 1: Introduction to Manufacturing

Directions: Read each statement carefully. Select the word or phrase that correctly answers or completes the statement, and write the appropriate letter in the blank.

Example: __D__ 21. The class that you are in is—

A. Health
B. Science
C. Art
D. Industrial Arts

___ 1. The study of building a product at one site and distributing it to another site for marketing is—

A. manufacturing technology
B. construction technology
C. material technology
D. building technology

___ 2. People using tools and techniques in the most efficient way is—

A. tooling
B. management
C. technology
D. material technology

___ 3. Building one product, one at a time, is—

A. line production
B. custom production
C. job-lot production
D. none of the above

___ 4. Producing a limited number of a specific product is—

A. line production
B. custom production
C. job-lot production
D. none of the above

___ 5. Producing a product continuously through job specification is—

A. line production
B. custom production
C. job-lot production
D. none of the above

___ 6. The organization that enforces and administers regulations in manufacturing companies so that employees are provided a safe working environment and conditions is the—

A. Welfare Board
B. Occupational Safety and Health Administration
C. Environmental Protection Agency
D. NASA

NATIONAL STANDARD SCHOOL SHOP SAFETY INSPECTION CHECK LIST
Prepared by the Joint Safety Committee of the
AMERICAN VOCATIONAL ASSOCIATION – NATIONAL SAFETY COUNCIL

______________________________ Date ______________

____

INTRODUCTION

A safe environment is an essential part of the school shop safety education program. The safe environment will exist only if hazards are discovered and corrected through *regular* and *frequent* inspections by school personnel – administrators, teachers and students. Safety inspections are to determine if everything is satisfactory.

Inspections may be made at the request of the board of education, the school administration or upon the initiative of the teacher. Some communities have drawn upon the cooperative service of professional safety engineers, inspectors of state labor departments, insurance companies and local safety councils to supplement and confirm inspections by school personnel.

The National Standard School Shop Safety Inspection Check List, recommended by the President's Conference on Industrial Safety is an objective inspection procedure for the school shop.

DIRECTIONS

WHO INSPECTS?

This will depend upon local policies. It is recommended, however, that shop teachers, and students – the student safety engineer and/or student safety committee – participate in making regular inspections.

This not only tends to share responsibility but stimulates a broader interest in the maintenance of a safe school shop.

WHEN TO INSPECT?

As a minimum, a safety inspection should be made at the beginning of every school term or semester. More frequent inspections may be advisable.

HOW TO INSPECT?

Inspections should be well planned in advance.

Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection reports should be clear and concise, but with sufficient explanation to make each recommendation for improvement understandable.

FOLLOW-UP

The current report should be compared with previous records to determine progress. The report should be studied in terms of the accident situation so that special attention can be given to those conditions and locations which are accident producers.

Each unsafe condition should be corrected as soon as possible in accordance with accepted local procedures.

A definite policy should be established in regard to taking materials and equipment out of service because of unsafe conditions.

The inspection report can be used to advantage as the subject for staff and class discussion.

CHECKING PROCEDURE

Draw a circle around the appropriate letter, using the following letter scheme:

S – Satisfactory (needs no attention)
A – Acceptable (needs some attention)
U – Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled.

Space is provided at the end of the form for such comments. Designate the items covered by the recommendations, using the code number applicable (as B-2).

In most categories, space is provided for listing of standards, requirements or regulations which have local application only.

A. GENERAL PHYSICAL CONDITION

1. Machines, benches, and other equipment are arranged so as to conform to good safety practices	S	A	U
2. Condition of stairways	S	A	U
3. Condition of aisles	S	A	U
4. Condition of floors	S	A	U
5. Condition of walls, windows, and ceiling	S	A	U
6. Illumination is safe, sufficient, and well placed	S	A	U
7. Ventilation is adequate and proper for conditions	S	A	U
8. Temperature control	S	A	U
9. Fire extinguishers are of proper type, adequately supplied, properly located and maintained	S	A	U
10. Teacher and pupils know location of and how to use proper type for various fires	S	A	U
11. Number and location of exits is adequate and properly identified	S	A	U
12. Proper procedures have been formulated for emptying the room of pupils and taking adequate precautions in case of emergencies	S	A	U
13. Lockers are inspected regularly for cleanliness and fire hazards	S	A	U
14. Locker doors are kept closed	S	A	U
15. Walls are clear of objects that might fall	S	A	U
16. Utility lines are properly identified	S	A	U
17. Teachers know the procedure in the event of fire including notification of the fire department and the evacuation of the building	S	A	U
18. Air in shop is free from excessive dust, smoke, etc.	S	A	U
19. ______________	S	A	U
20. ______________	S	A	U
21. ______________	S	A	U
22. ______________	S	A	U
23. Evaluation for the total rating of A GENERAL PHYSICAL CONDITION	S	A	U

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B. HOUSEKEEPING

1. General appearance as to orderliness . . . . S A U
2. Adequate and proper storage space for tools and materials . . . . S A U
3. Benches are kept orderly . . . . S A U
4. Corners are clean and clear . . . . S A U
5. Special tool racks, in orderly condition, and provided at benches and machines . . . . S A U
6. Tool, supply, and/or material room is orderly . . . . S A U
7. Sufficient scrap boxes are provided . . . . S A U
8. Scrap stock is put in scrap boxes promptly . . . . S A U
9. Materials are stored in an orderly and safe condition . . . . S A U
10. A spring lid metal container is provided for waste and oily rags . . . . S A U
11. All waste materials and oily rags are promptly placed in the containers . . . . S A U
12. Containers for oily rags and waste materials are frequently and regularly emptied . . . . S A U
13. Dangerous materials are stored in metal cabinets . . . . S A U
14. Machines have been color conditioned . . . . S A U
15. Safety cans are provided for flammable liquids . . . . S A U
16. Bulk storage of dangerous materials is provided outside of the main building . . . . S A U
17. A toe board or railing around a mezzanine used for storage or washing facilities . . . . S A U
18. Materials are stored in an orderly and safe condition on this mezzanine . . . . S A U
19. Flammable liquids are not used for cleaning purposes . . . . S A U
20. Floors are free of oil, water and foreign material . . . . S A U
21. Floors, walls, windows, and ceilings are cleaned periodically . . . . S A U
22. ______________________ S A U
23. ______________________ S A U
24. ______________________ S A U
25. ______________________ S A U
26. Evaluation for the total rating for B. HOUSEKEEPING S A U

C. EQUIPMENT

1. Machines are arranged so that workers are protected from hazards of other machines, passing students, etc. . . . . S A U
2. Danger zones are properly indicated and guarded . . . . S A U
3. All gears, moving belts, etc., are protected by permanent enclosure guards . . . . S A U
4. All guards are used as much as possible . . . . S A U
5. All equipment control switches are easily available to operator . . . . S A U
6. All machines are "locked off" when instructor is out of the room . . . . S A U
7. Brushes are used for cleaning equipment . . . . S A U
8. Nonskid areas are provided around machines . . . . S A U
9. Machines are in safe working condition . . . . S A U
10. Machines are guarded to comply with American Standards Association and local state code . . . . S A U
11. Adequate supervision is maintained when students are using machines and dangerous tools . . . . S A U
12. Tools are kept sharp, clean and in safe working order . . . . S A U
13. All hoisting devices are in safe operating condition . . . . S A U
14. Machines are shut off while unattended . . . . S A U

C. EQUIPMENT (continued)

15. Adequate storage facilities for tools, equipment, etc., not in immediate use . . . . S A U
16. ______________________ S A U
17. ______________________ S A U
18. ______________________ S A U
19. ______________________ S A U
20. Evaluation for the total rating for C. EQUIPMENT . . S A U

D. ELECTRICAL INSTALLATION

1. All switches are enclosed . . . . S A U
2. There is a master control switch for all of the electrical installations . . . . S A U
3. Electrical outlets and circuits are properly identified . . . S A U
4. All electrical extension cords are in safe condition and are not carrying excessive loads . . . . S A U
5. All machine switches are within easy reach of the operators . . . . S A U
6. Electrical motors and equipment are wired to comply with the National Electric Code . . . . S A U
7. Individual cut-off switches are provided for each machine . . . . S A U
8. Machines are provided with overload and underload controls by magnetic pushbutton controls . . . . S A U
9. No temporary wiring in evidence . . . . S A U
10. ______________________ S A U
11. ______________________ S A U
12. ______________________ S A U
13. ______________________ S A U
14. Evaluation for the total rating for D. ELECTRICAL INSTALLATION . . . . S A U

E. GAS

1. Gas flow to appliances is regulated, so that when appliance valve is turned on full, the flames are not too high . . S A U
2. Gas appliances are properly insulated with asbestos or other insulating material from tables, benches, adjacent walls or other flammable materials . . . . S A U
3. No gas hose is used where pipe connections could be made . . . . S A U
4. Gas appliances have been adjusted so that they may be lighted without undue hazard . . . . S A U
5. Students have been instructed when lighting gas appliances to light the match first before turning on the gas . . . S A U
6. There are no gas leaks, nor is any odor of gas detectable in any part of the shop . . . . S A U
7. Shop instruction has been given concerning the lighting of gas furnaces operating with both air and gas under pressure . . . . S A U
8. When lighting the gas forge, goggles are worn . . . . S A U
9. When lighting the gas furnace, the following procedure is used: (a) light the match; (b) turn on the gas; (c) drop the match in the hole in top of the furnace . . . . S A U
10. In shutting down the gas furnace, the gas valve is closed before the air valve . . . . S A U
11. ______________________ S A U
12. ______________________ S A U
13. ______________________ S A U

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E. GAS (continued)

14. ________________ S A U

15. Evaluation for the total rating for E. GAS . . . . S A U

F. PERSONAL PROTECTION

1. Goggles or protective shields are provided and required for all work where eye hazards exist . . . . S A U
2. If individual goggles are not provided, hoods and goggles are properly disinfected before use . . . . S A U
3. Shields and goggles are provided for electric welding . . . S A U
4. Rings and other jewelry are removed by pupils when working in the shop . . . . S A U
5. Proper kind of wearing apparel is worn and worn properly for the job being done . . . . S A U
6. Leggings, safety shoes, etc., are worn in special classes such as foundry, etc., when needed . . . . S A U
7. Respirators are provided for dusty or toxic atmospheric conditions such as when spraying in the finishing room . . . . . S A U
8. Provisions are made for cleaning and sterilizing respirators . . . . S A U
9. Students are examined for safety knowledge ability . . . . S A U
10. Sleeves are rolled above elbows when operating machines S A U
11. Clothing of students is free from loose sleeves, flopping ties, loose coats, etc. . . . . S A U
12. ________________ S A U
13. ________________ S A U
14. ________________ S A U
15. ________________ S A U
16. Evaluation for the total rating for F. PERSONAL PROTECTION . . . . S A U

G. INSTRUCTION

1. Shop Safety is taught as an integral part of each teaching unit . . . . S A U
2. Safety rules are posted particularly at each danger station . . . . S A U
3. Printed safety rules are given each student . . . . S A U
4. Pupils take a safety pledge . . . . S A U
5. Use of a safety inspector . . . . S A U
6. Use of a student shop safety committee . . . . S A U
7. Use of safety contests . . . . S A U
8. Motion and/or slide films on safety are used in the instruction . . . . S A U
9. Use of suggestion box . . . . S A U
10. Use of safety tests . . . . S A U
11. Use of safety posters . . . . S A U
12. Talks on safety are given to the classes by industrial personnel . . . . S A U
13. Tours are taken of industrial plants as a means of studying safety practices . . . . S A U
14. Periodic safety inspections of the shop are made by a student committee . . . . S A U
15. Personnel from industry make safety inspections of the shop . . . . S A U
16. Student shop safety committee investigates all accidents. S A U
17. A proper record is kept of safety instructions which are given, preferably showing the signature of student on items given in this area . . . . S A U

G. INSTRUCTION (continued)

18. Rotate students on the Shop Safety Committee so that as many students as possible have an opportunity to participate S A U
19. ________________ S A U
20. ________________ S A U
21. ________________ S A U
22. ________________ S A U
23. Evaluation for the total rating of G. INSTRUCTION . S A U

H. ACCIDENT RECORDS

1. There is a written statement outlining the proper procedure when and if a student is seriously hurt . . . . S A U
2. Adequate accident statistics are kept . . . . S A U
3. Accidents are reported to the proper administrative authority by the instructor . . . . S A U
4. A copy of each accident report is filed with the State Department of Education . . . . S A U
5. Accident reports are analyzed for instructional purposes and to furnish the basis for elimination of hazards . . . . S A U
6. ________________ S A U
7. ________________ S A U
8. ________________ S A U
9. ________________ S A U
10. Evaluation for the total rating of H. ACCIDENT RECORDS . . . . S A U

I. FIRST AID

1. An adequately stocked first aid cabinet is provided . . . . S A U
2. The first aid is administered by a qualified individual . . S A U
3. The school has individuals qualified to administer first aid . . . . S A U
4. . . . . S A U
5. . . . . S A U
6. . . . . S A U
7. . . . . S A U
8. Evaluation for the total rating of I. FIRST AID . . . . . S A U

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RECOMMENDATIONS

Code No.	

HAZARDOUS CONDITIONS REPORT

This is a suggested method for reporting the hazard and directing action to see that the hazard is corrected or removed.

If a hazard exists, the operation should be "red tagged" and shut down until corrected.

HAZARDOUS CONDITIONS REPORT

Date____________________

To: ____

(Building Administrator) (Position) (School)

Description and Location of Health or Safety Hazard: ____________________

____

____

____

Suggested Solution: ____

____

____

Teacher Signature: ____________________

Distribution: Original - Building Administrator
1st Copy - Department Head
2nd Copy - Teacher Reporting Hazard
3rd Copy - District Safety Officer

Action Taken: ____

____

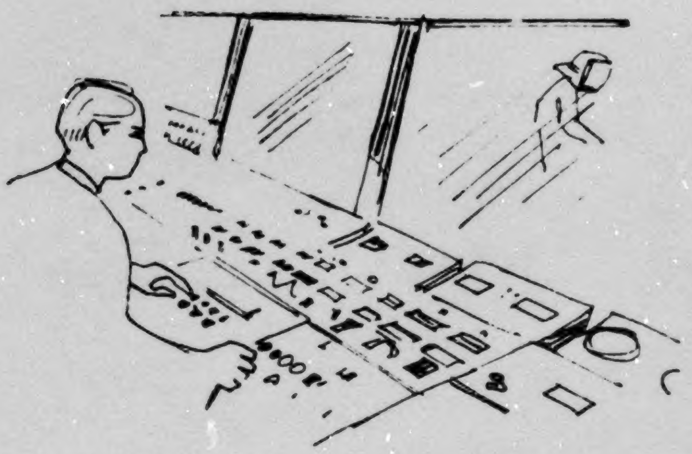
____

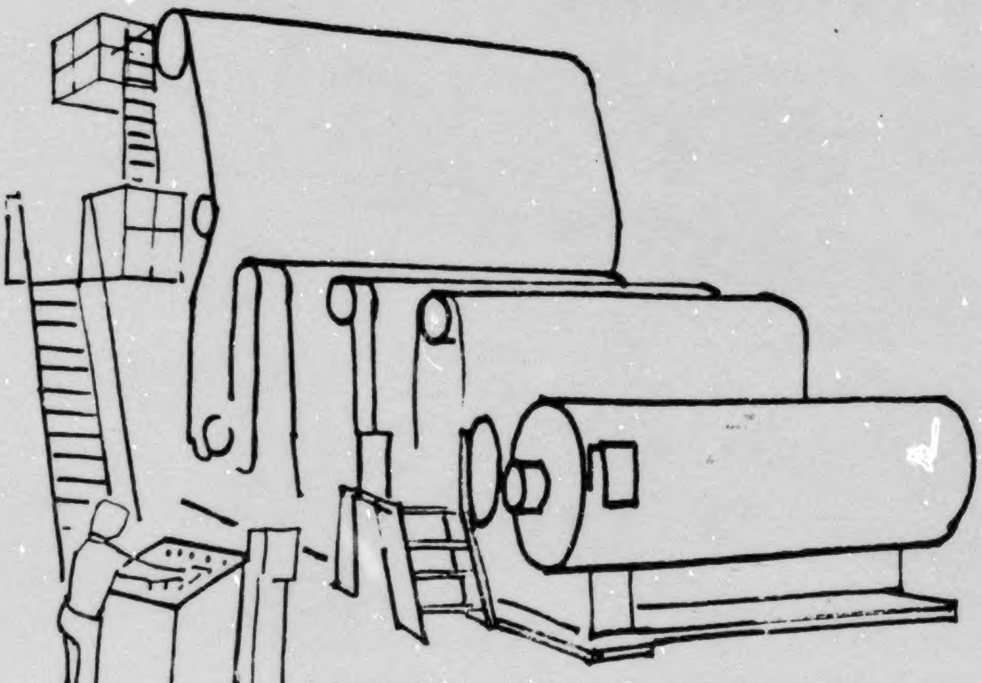
____

By Whom: ____________________________

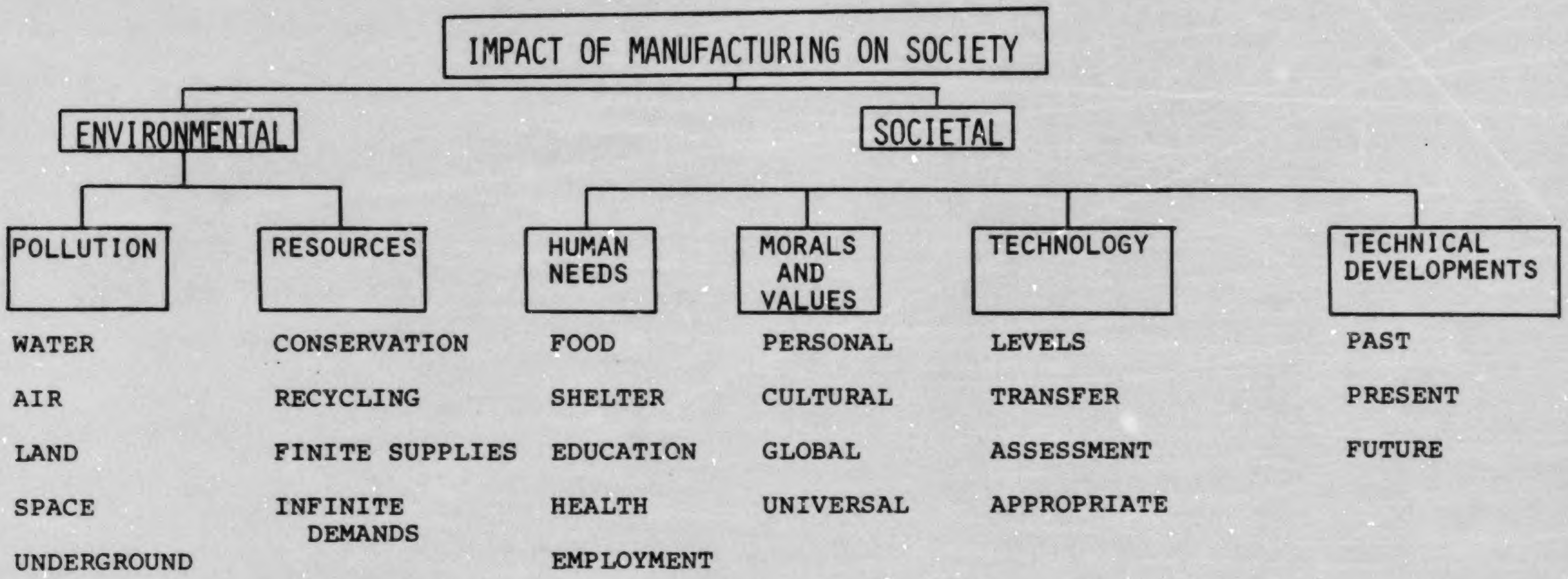
(Signature)

MANUFACTURING
TECHNOLOGY





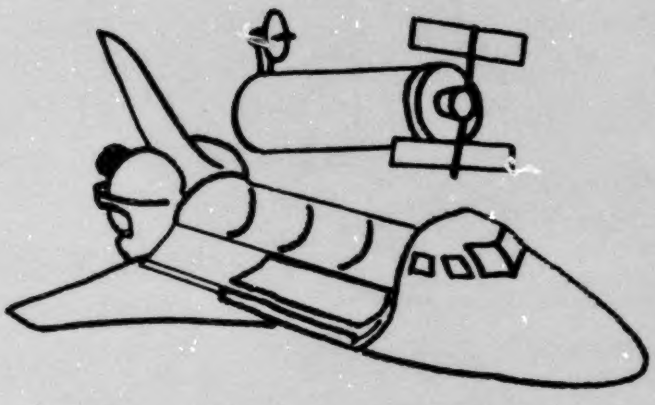
M1-2

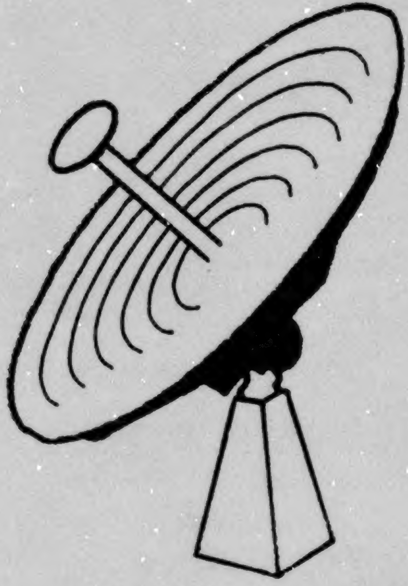


IMPACT OF MANUFACTURING ON SOCIETY

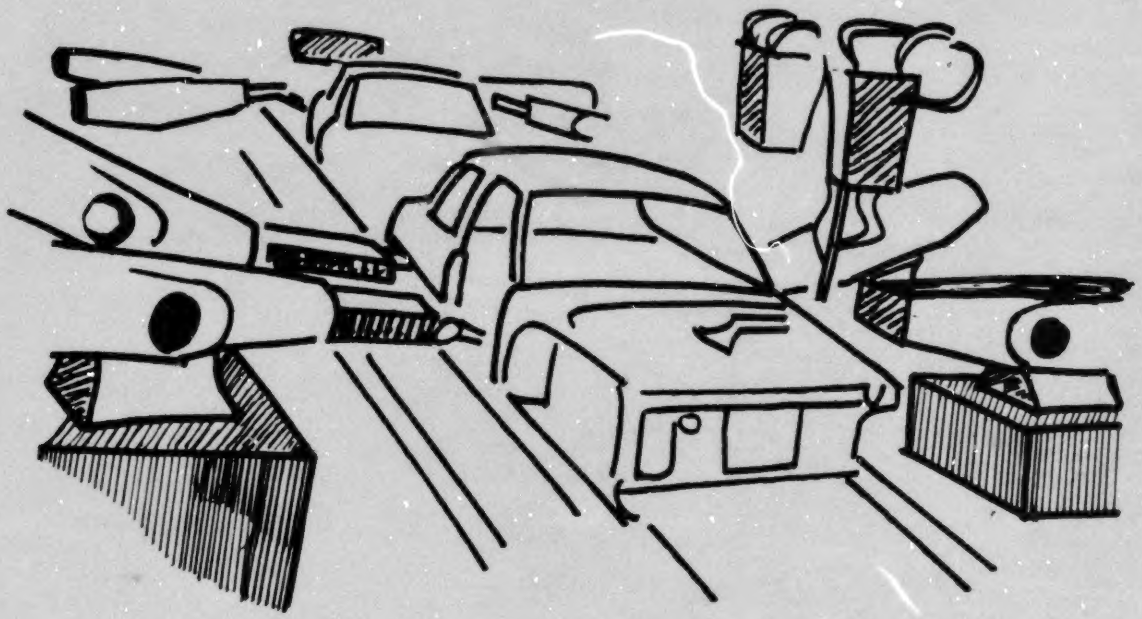
- ENVIRONMENTAL
  - POLLUTION
    - WATER
    - AIR
    - LAND
    - SPACE
    - UNDERGROUND
  - RESOURCES
    - CONSERVATION
    - RECYCLING
    - FINITE SUPPLIES
    - INFINITE DEMANDS
- SOCIETAL
  - HUMAN NEEDS
    - FOOD
    - SHELTER
    - EDUCATION
    - HEALTH
    - EMPLOYMENT
  - MORALS AND VALUES
    - PERSONAL
    - CULTURAL
    - GLOBAL
    - UNIVERSAL
  - TECHNOLOGY
    - LEVELS
    - TRANSFER
    - ASSESSMENT
    - APPROPRIATE
  - TECHNICAL DEVELOPMENTS
    - PAST
    - PRESENT
    - FUTURE

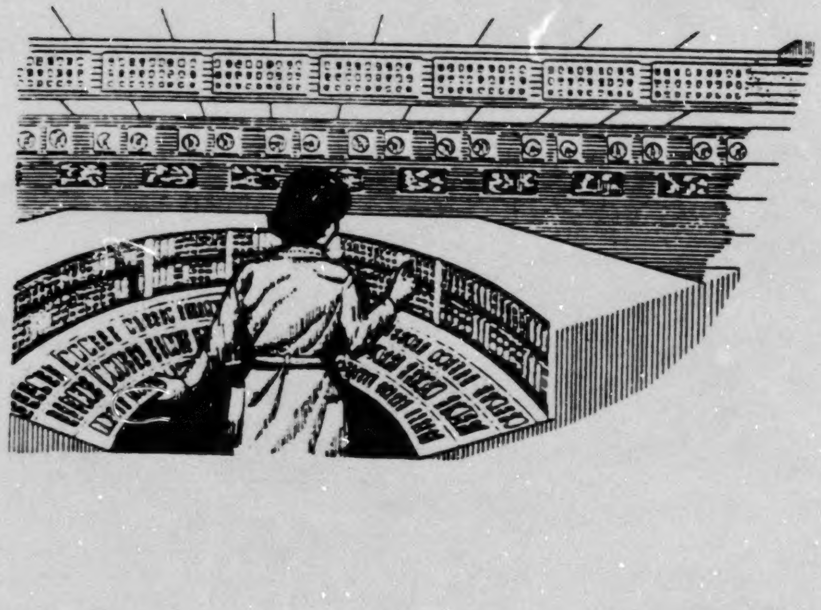
WHAT IS TECHNOLOGY?





FUTURE TRENDS IN MANUFACTURING



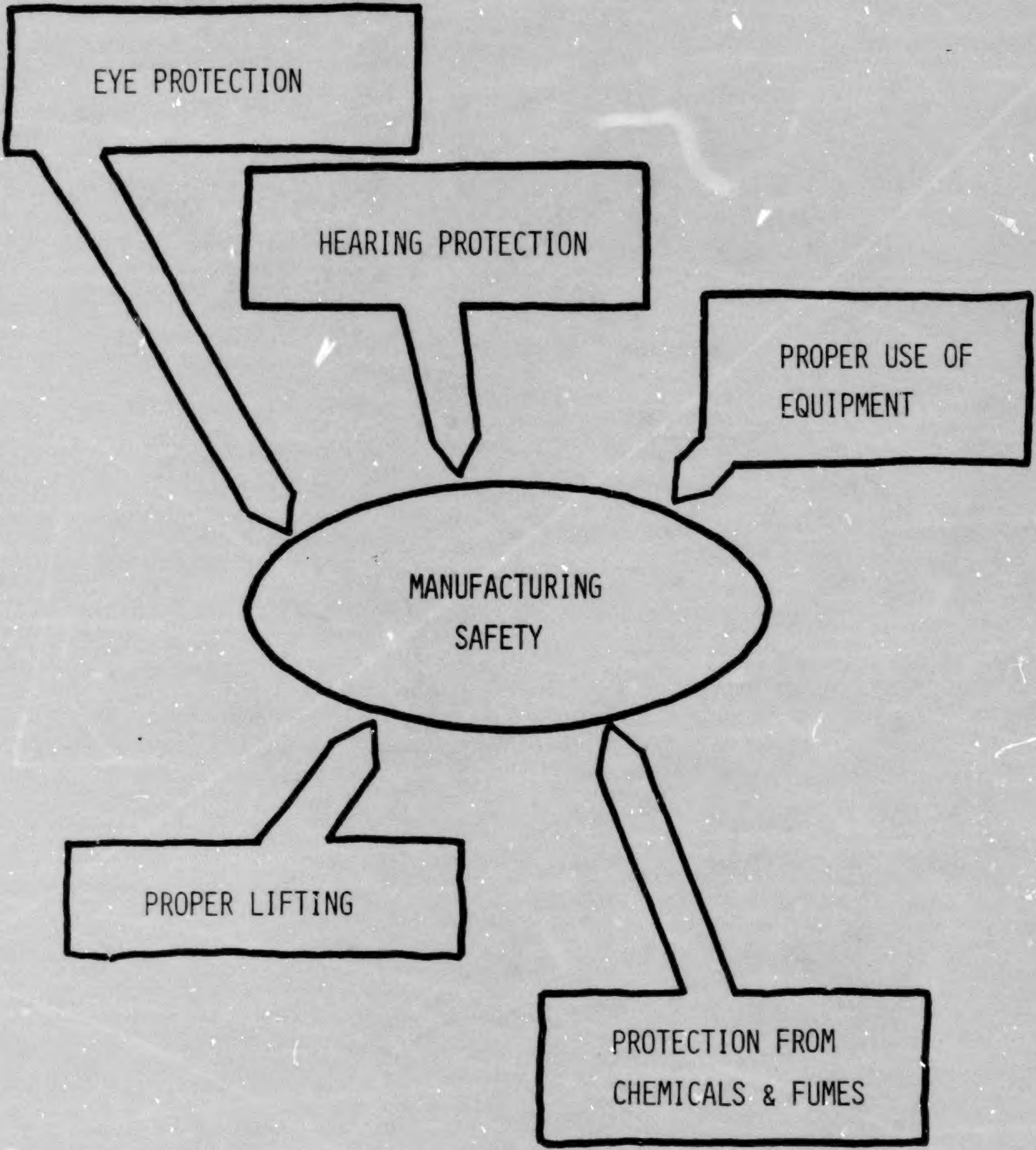


THREE TYPES OF PRODUCTION

CUSTOM PRODUCTION - IT IS ONE PERSON OR A GROUP OF PEOPLE PRODUCING ONE PRODUCT OR SERVICE, ONE AT A TIME.

JOB-LOT PRODUCTION - IT IS WHERE ONLY A LIMITED NUMBER OF A PARTICULAR PRODUCT OR SERVICE IS MANUFACTURED.

LINE PRODUCTION - IT IS WHERE LARGE QUANTITIES OF A PRODUCT OR SERVICE IS MANUFACTURED THROUGH AUTOMATED PROCESSES AND THE WORKER PERFORMS ONLY ONE JOB CONTINUOUSLY ON THAT PRODUCT OR SERVICE.



MANUFACTURING SAFETY

EYE PROTECTION

HEARING PROTECTION

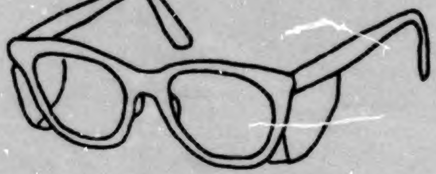
PROPER USE OF EQUIPMENT

PROPER LIFTING

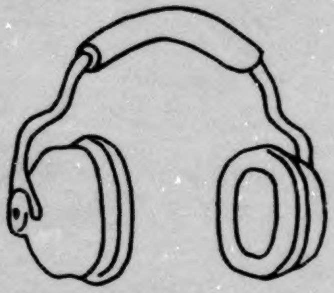
PROTECTION FROM CHEMICALS & FUMES

PROTECTIVE EQUIPMENT

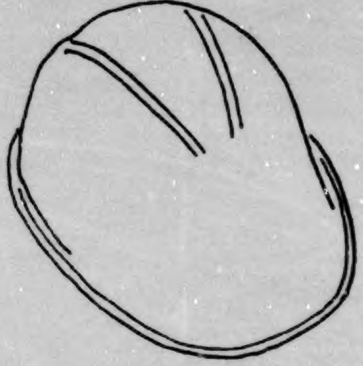
SAFETY GLASSES



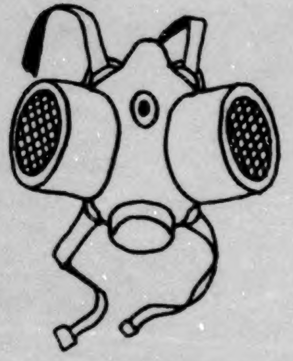
HEARING PROTECTOR

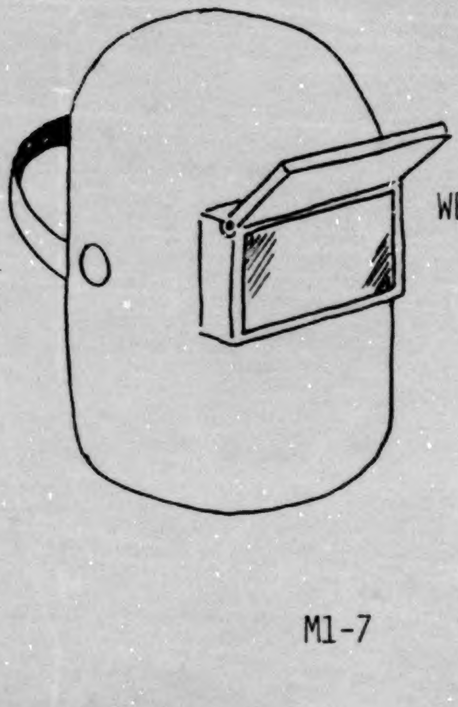


HARD CAP



RESPIRATOR





WELDING HELMET

2

Materials Processing

OBJECTIVES

After the students have covered the material in this unit, they should be able to—

1. distinguish between primary and secondary processing and be able to give examples of each;
2. perform some common secondary material processing activities;
3. describe the basic nature, classifications, and properties of materials;
4. analyze industrial materials in their ecological balance, the use and conservation of natural resources, and the recycling and energy efficiency of industrial materials and products; and
5. display ability in the evaluation of products in terms of appropriateness of materials, design function, and quality of construction.

KEY WORDS: VOCABULARY

The words in the following list may be new to the students studying manufacturing. Teachers should help students understand these words as they are used in this topic of study.

processing
primary processing
secondary processing
casting
forming
separating
conditioning
assembling
finishing
raw materials
industrial materials
metallic materials
ceramic materials
polymeric materials

TEACHING AIDS

- Overhead projector
- Appendices A and B
- Test Key: 1-A, 2-B, 3-D, 4-C, 5-B, 6-A, 7-C, 8-B
- Transparencies: You will find transparencies M2-1 through M2-4 at the end of this unit. If you wish, these masters may be duplicated in quantity and given as handouts to the students while they are studying the different aspects of this unit.
    M2-1: Primary Processing
    M2-2: Secondary Processing
    M2-3: Material Testing
    M2-4: Environmental and Ecological Factors of Materials Processing

SUGGESTED REFERENCES

Bame, E.A., and Cummings, P. Exploring Technology. Worchester, Mass.: Davis Publications, 1980.

Fales, James; Sheets, Everett; Mervich, Gregg; and Dinan, John. Manufacturing: A Basic Text for Industrial Arts. Bloomington, Ill.: McKnight Publishing Company, 1980.

Groneman, Chris H., and Grannis, Gary E. Exploring the Industries. Albany, N.Y.: Delmar Publishers, 1981.

Jambro, Donald J. Introduction to Manufacturing. Albany, N.Y.: Delmar Publishers, 1982.

Lux, Donald G., and Ray, Willis E. World of Manufacturing. Bloomington, Ill.: McKnight Publishing Company, 1971.

Thode, Bradley R. Materials Processing. Albany, N.Y.: Delmar Publishers, 1982.

SENTENCE OUTLINE

I. Primary processing (Transparency M2-1)
   A. **Primary processing** is transforming raw materials into industrial materials.
   B. **Industrial materials** that are produced from raw materials can be divided into three categories:
      1. **Metallic materials** are inorganic substances composed of metallic elements with a tightly packed crystal structure.
      2. **Ceramic materials** are crystallic substances composed of compounds of metallic and nonmetallic elements.
      3. **Polymeric materials** are noncrystallic hydrocarbon substances, carbon being the major element. They are composed of a large molecular chain.
II. Secondary processing (Transparency M2-2)
   A. **Secondary processing** is converting industrial materials in standard stock into consumable products.
   B. Six processes are used to change industrial materials in standard stock into consumable products:
      1. **Casting** is the process of taking an industrial material in a liquid state, pouring it into a predesigned mold, and allowing it to solidity before removing it.
      2. **Forming** is the process of changing the size and/or shape of an industrial material without changing its volume.
      3. **Separating** is the process of removing excess material from industrial materials to change its size, shape, and/or surface finish.
      4. **Assembling** is the process of combining industrial materials together.
      5. **Conditioning** is the process of changing the mechanical properties of an industrial material by heating, firing, or by chemical action.
      6. **Finishing** is the process of treating the surface of an industrial material either to protect it or to decorate it.
III. Basic nature, classification, and properties of materials (Transparency M2-3)
   A. The basic structure of materials is determined by its atomic structure.
   B. Raw materials are obtained by mining, refining, harvesting, and chemical synthesis.
   C. Materials can be classified as metals and nonmetals:
      1. Metals are subdivided into ferrous and nonferrous.
         a. Iron and steel are ferrous metals.
         b. Nonferrous metals are subdivided into alloys and elements:
            (1) Examples of alloys are brass, magnesium, and aluminum.
            (2) Examples of elements are copper, zinc, and nickel.
   D. The properties of materials are divided into four categories. These are physical, chemical, electrical, and thermal.
      1. physical properties
         a. specific gravity
         b. hardness
         c. tensile strength
         d. impact strength
         e. compression strength
         f. malleability
         g. stress
         h. ductility
      2. Chemical properties are rated by how they resist certain chemicals.
      3. electrical properties
         a. arc resistance
         b. dielectric constant
         c. dielectric strength

        - d. dissipation factor
    - 4. thermal properties
        - a. conductivity
        - b. expansion

IV. Analyzing industrial material (Transparency M2-4)

- A. The processing of materials from their raw state to a finished product has created some concern among ecologists and environmentalists.
- B. Environmentalists have been concerned with how we extract certain raw materials from the earth, such as strip mining for ore deposits.
- C. Pollution standards have been created to cut down on the amount of hydrocarbons and other pollutants being released into the atmosphere during the processing stages of industrial materials.
- D. The proper and safe storage of industrial by-products is also a very important consideration in material processing.
- E. The recycling of renewable materials is one way of conserving our limited resources.

V. Materials selection

- A. The proper selection of appropriate materials for a particular product is crucial to its design function and quality of construction.
- B. The materials selected for a particular product must meet certain preset industrial standards.
- C. The materials selected for a particular industrial product affect the way the overall manufacturing process is set up and what jigs and fixtures are needed.
- D. The materials selected for a particular industrial product also affect the final cost of the product when it is marketed.

MATERIALS FOR STUDENTS

- Vocabulary worksheet
- Appendices A and B

SUGGESTED STUDENT ACTIVITIES

1. Show a film to your class that shows the production of industrial products from raw materials. The film should emphasize primary processing activities.
2. Have students analyze a series of industrial products, and list the primary and secondary processes used to manufacture them.
3. Have students produce selected cast parts or products using a variety of materials and processes.
4. Have students produce selected mechanical parts or products using a variety of materials and separating processes.
5. Have students produce formed parts or products using a variety of materials and forming processes.
6. Have students condition parts in products they produced by casting in molding, forming, or separating.
7. Have students bind and mechanically fasten parts produced by casting in molding, forming, or separating to produce subassemblies and/or products.
8. Have students apply finish to previously produced parts, subassemblies, and products.
9. Have students test various materials for thermal conductivity, thermal expansion, compression strength, tensile strength, and impact strength.
10. Have student research the ecological and environmental factors of processing material now and in the future.

Vocabulary Worksheet

1. processing
2. primary processing
3. secondary processing
4. casting
5. forming
6. separating
7. conditioning
8. assembling
9. finishing
10. raw materials
11. industrial materials
12. metallic materials
13. ceramic materials
14. polymeric materials

TEST

Unit 2: Materials Processing

Directions: Read each statement carefully. Select the word or phrase that correctly answers or completes the statement, and write the appropriate letter in the blank.

Example: __D__ 21. The class that you are in is—

A. Health
B. Science
C. Math
D. Industrial Arts

___ 1. Transforming raw materials into industrial materials is—

A. primary processing
B. secondary processing
C. auxiliary processing
D. alternative processing

___ 2. Converting industrial materials in standard stock into consumable products is—

A. primary processing
B. secondary processing
C. auxiliary processing
D. alternative processing

___ 3. The process of taking an industrial material in a liquid state, pouring it into a predesigned mold, and allowing it to solidify before removing it is—

A. separating
B. forming
C. conditioning
D. casting

___ 4. The process of changing the mechanical properties of industrial materials by heating, firing, or by chemical action is—

A. separating
B. forming
C. conditioning
D. casting

___ 5. The process of changing the size and/or shape of an industrial material without changing its volume is—

A. separating
B. forming
C. conditioning
D. casting

___ 6. The process of removing excess material from industrial materials to change the size, shape, and/or surface finish is—

A. separating
B. forming
C. conditioning
D. casting

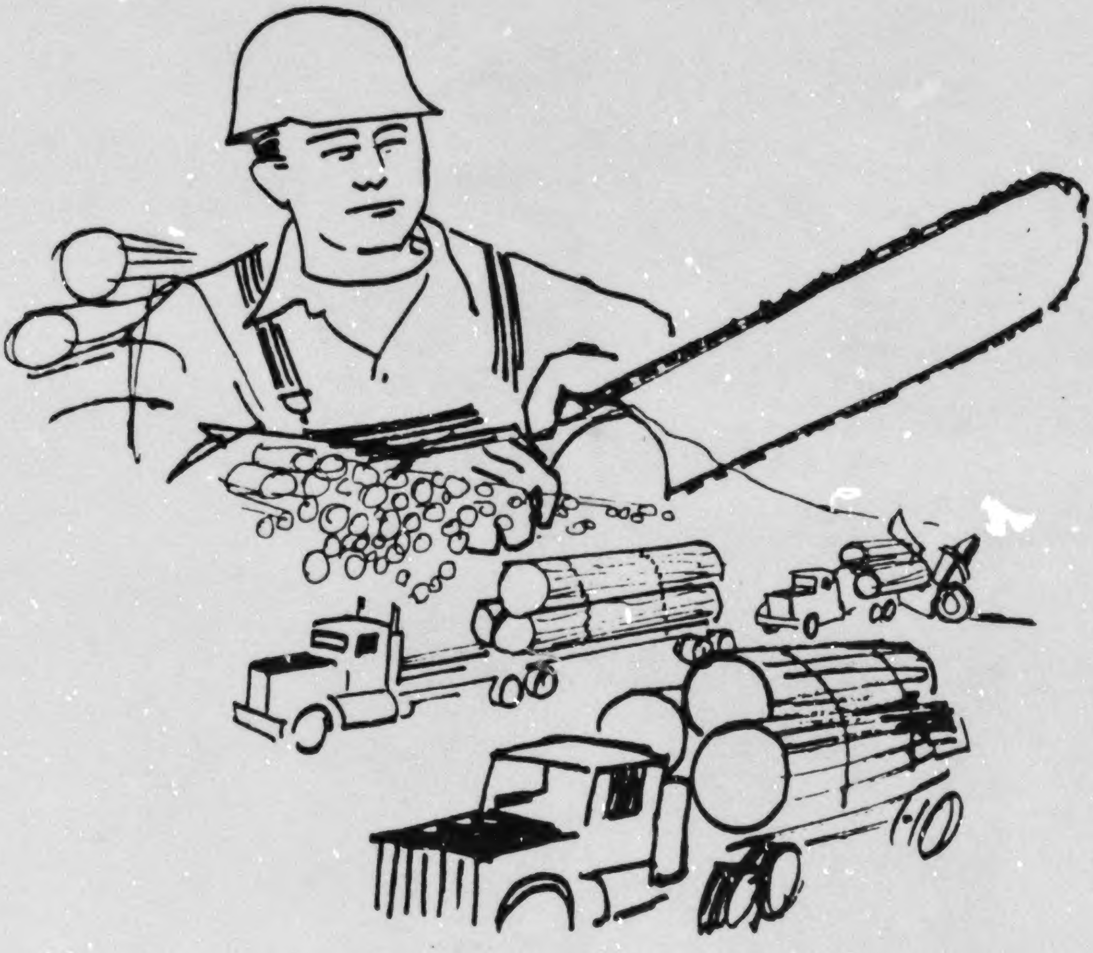
___ 7. The process of combining industrial materials is—

A. forming
B. finishing
C. assembling
D. casting

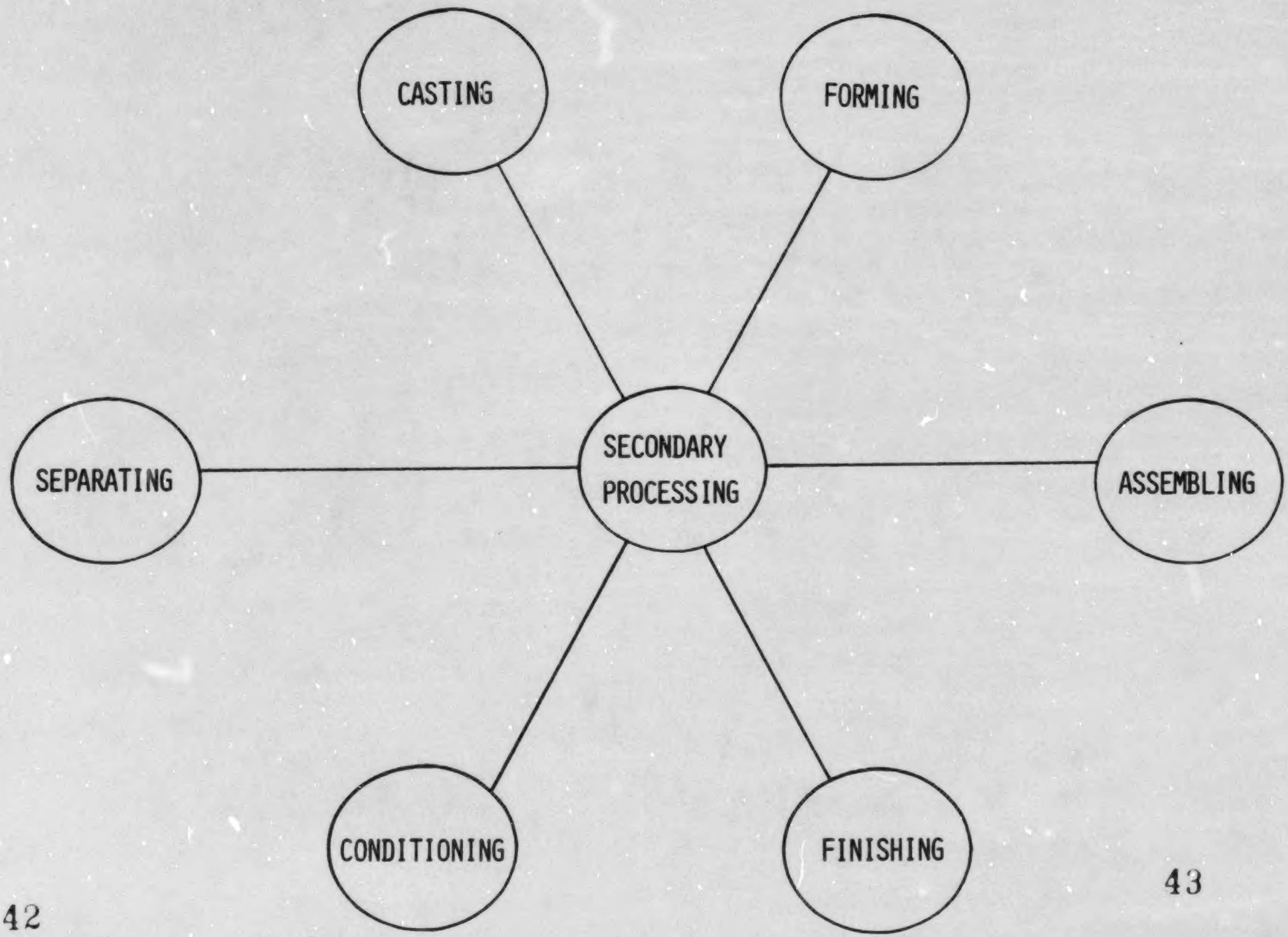
___ 8. The process of treating the surface of an industrial material either to protect it or to decorate it is—

A. forming
B. finishing
C. assembling
D. casting

PRIMARY PROCESSING IS TRANSFORMING RAW MATERIALS INTO INDUSTRIAL MATERIALS.

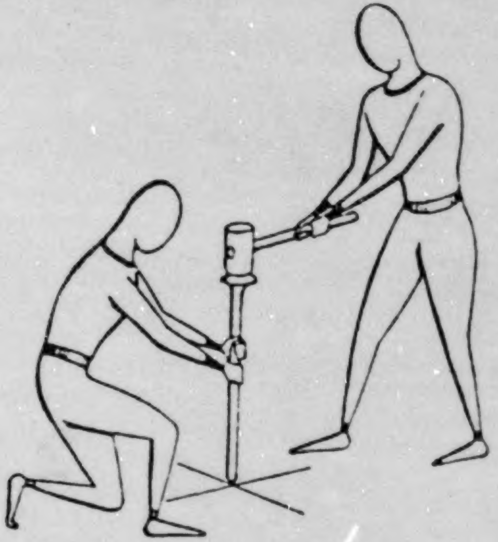


M2-2


CASTING
FORMING
SEPARATING
SECONDARY PROCESSING
ASSEMBLING
CONDITIONING
FINISHING

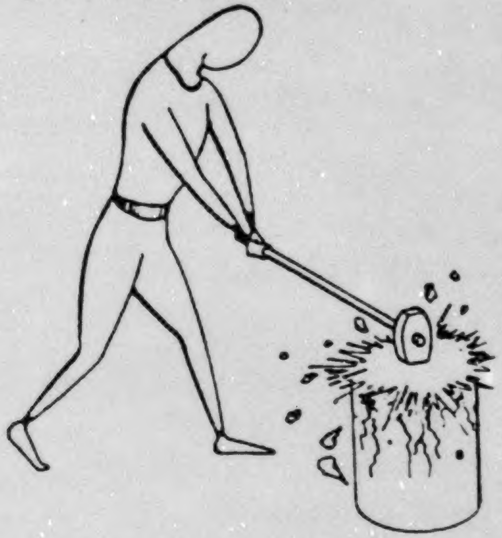
MATERIAL TESTING

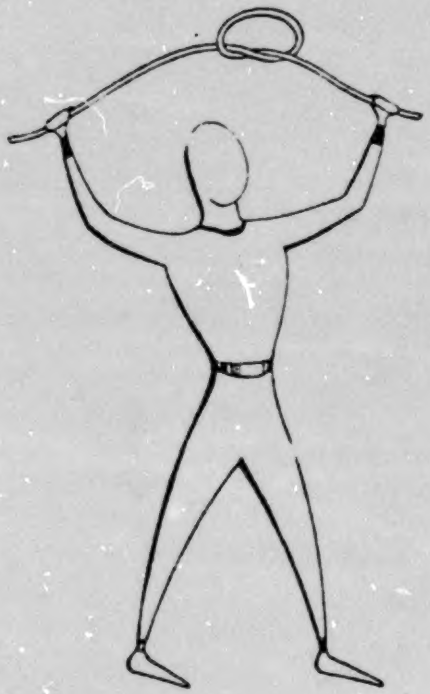
M2-3



HARDNESS

BRITTLENESS





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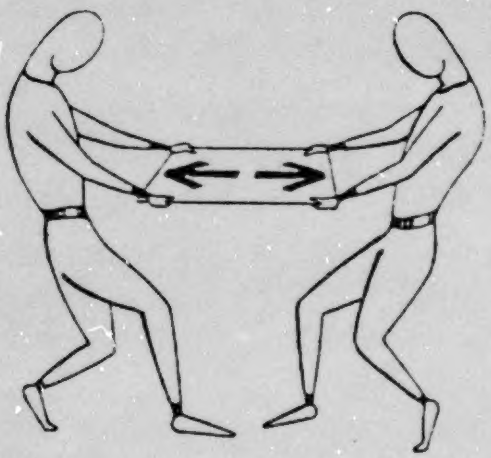
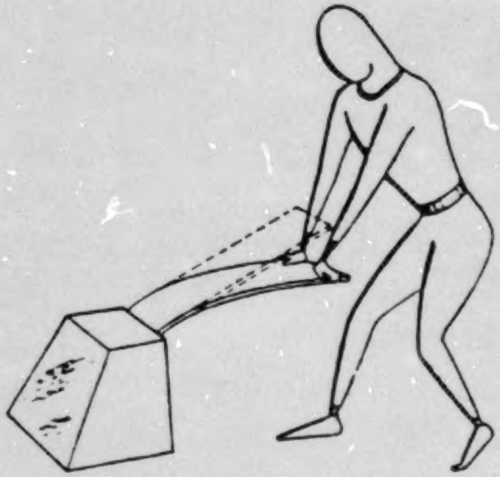


TENSILE STRENGTH

ELASTICITY



ENVIRONMENTAL & ECOLOGICAL FACTORS OF MATERIALS PROCESSING

- Waste disposal sites
- Polluted lakes, rivers, or streams
    - loss of recreation
    - odors
    - loss of fish
    - loss of business (fishing, recreation, etc.)
- Air pollution
    - automobiles
    - industry
    - agricultural burning
- Culmination of rubbish
    - disease
    - flies, rats, etc.
    - unsightly neighborhoods
    - reduced property value
- Increased noise pollution
    - airports
    - industry
    - urbanization

3

Personnel Management

OBJECTIVES

After the students have covered the material in this unit, they should be able to—

1. understand how to apply for a job and know how to fill out a job application form;
2. demonstrate the key factors regarding interviewing for a job;
3. understand how the manufacturing industry hires, trains, advances, retrains, demotes, and retires workers;
4. understand what careers are available in the manufacturing industry; and
5. relate the relationship, duties, and responsibilities of youth leadership as a function of personnel management.

KEY WORDS: VOCABULARY

The words in the following list may be new to the students studying manufacturing. Teachers should help students understand these words as they are used in this topic of study.

personnel system
decision making
vendor
enterprise
organize
manage
technical
professional worker
technical worker
skilled worker

semiskilled worker
nonskilled worker
industrial and commercial resources
hiring
training
advancing
retraining
demoting
retiring
career

TEACHING AIDS

- Overhead projector
- Appendices A and B
- Test Key: 1-C, 2-A, 3-B, 4-D, 5-B, 6-A, 7-D, 8-C, 9-A, 10-D
- Transparencies: You will find transparencies M3-1 through M3-19 at the end of this unit. If you wish, these masters may be duplicated in quantity and given as handouts to the students while they are studying the different aspects of this unit.
    M3-1: How to Apply for a Job
    M3-2: Application for Employment
    M3-3: Interviewing for a Job
    M3-4: Reasons for Hiring an Applicant
    M3-5: Format for Collecting Career Information
    M3-6: Field Trip Observation Form
    M3-7: Entry-level Employment Requirements
    M3-8: Resource Person Information Sheet
    M3-9: The Student Association as Personnel System with Uniform Titles
    M3-10: AIASA Personnel In-Class Duties
    M3-11: Committee Duties
    M3-12: Organizational Structure
    M3-13: In-Class Meeting Procedures

M3-14: How Motions Are Made
M3-15: Duties for In-Class Use of Community Resources
M3-16: Duties for In-Class Service Projects
M3-17: Duties for In-Class Enterprising Products
M3-18: Duties for In-Class Contests or Recognition
M3-19: Regional, State, and National Recognition Events for Industrial Arts Students

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SENTENCE OUTLINE

I. Applying for a job (Transparency M3-1)
  A. Knowing how to look for a job and apply for it are crucial to finding the right job for you
  B. There are several good sources for finding job possibilities:
    1. public employment commissions
    2. private employment agencies
    3. education and manpower schools/facilities
    4. newspapers, magazines, government publications, and so forth
    5. word of mouth
  C. After you locate several job possibilities, you need to make proper application for each job in which you are interested.
    1. Job application forms can be obtained and filled out at the employment agency or at the manufacturing company's office. (Transparency M3-2)
    2. It is crucial to your success in obtaining an interview for the job that you read the job application form carefully before you start filling out the form. Be sure to follow the instructions exactly.
  D. Being prepared for the interview is a key to your success in obtaining the job. (Transparency M3-3)
    1. Your appearance should be neat.
    2. You should have a positive attitude.
    3. You should arrive at the interview approximately fifteen (15) minutes before your interview is scheduled.

4. You should be polite, courteous, and honest during the interview.
5. You should be enthused about the job for which you are applying.
6. You need to communicate well with the interviewer.

II. Understanding how the manufacturing industry hires, trains, advances, retrains, demotes, and retires workers

A. Among the many reasons for hiring one applicant over another are—(Transparency M3-4)

1. previous work experience
2. interest in the specific job
3. recommendations from previous employers
4. training background
5. personal appearance
6. manners and mannerisms
7. personality
8. ambition
9. maturity
10. educational background

B. Through training programs, workers can advance in the company structure.

C. Due to many changes in technology and business conditions, many manufacturing companies are now retraining their employees to keep up with these changes.

D. Being demoted or fired from a job could affect your possibilities for future employment. Five basic reasons why workers get demoted or fired:

1. absenteeism
2. not qualified to perform tasks
3. continuously makes costly mistakes
4. does not follow instructions
5. lacks interest in job

E. Retiring from a job after many years of job satisfaction is very rewarding. Through many manufacturing companies, you will receive a company pension, based on the number of years of service.

III. Careers in the manufacturing industry

A. Most people work an average of 25 to 45 years, a significant part of their lives. Jobs are growing increasingly specialized in almost every field, including the manufacturing industry. New technologies are creating a demand for highly skilled men and women. As a result, employers are putting a premium on specific skills. Career planning is becoming essential. Now is the time to start looking at the various options and directions a student may want to pursue. (Transparency M3-5)

B. The first step in choosing a career is to consider the vast array of careers in existence today. We will take a look at the various opportunities in the manufacturing field. (Transparency M3-6)

C. For purposes of structuring and highlighting a select number of occupations in the field of manufacturing, this unit is divided into occupations as they relate to the classifications of workers.

1. professional
2. technical
3. skilled
4. semiskilled
5. nonskilled

D. A look at the various occupational levels will help you understand the specific occupations discussed later. (Transparency M3-7 and M3-8)

1. **Professional workers.** A college education is required, or four or more years of formal education beyond the high school level. Architects, engineers, researchers, teachers, high-level managers, and most executives are among these.

    2. **Technical workers.** Some college and technical training is required, but not necessarily a college degree. Drafters, engineering assistants, and technicians are among these.
    3. **Skilled workers.** Lengthy preparation through on-the-job training or through apprenticeship programs is required. Carpenters, plumbers, electricians, and roofers are among these.
    4. **Semiskilled workers.** Considerable on-the-job training is required. Generally, these persons are machine operators and are employed in every major industry.
    5. **Nonskilled workers.** Little on-the-job training is required. Helpers and laborers fall into this occupational category.

E. Examples of professional workers in the manufacturing industry
    1. **Engineers.** Engineers are involved in the research and development, production, and quality control of manufactured products and services.
    2. **Chemists.** Chemists work with research and development and material preparation and testing.
    3. **Statisticians.** These professionals work in the area of quality control, production scheduling, and marketing analysis.

F. Examples of technical workers in the manufacturing industry
    1. **Technicians.** These workers aid engineers in designing and building prototype models. Technicians also repair and service products for customers.
    2. **Drafters.** Drafters produce detail working and assembly drawings for fabricating and producing products.
    3. **Technical writers.** These workers write training and technical manuals for operating and maintaining products.

G. Examples of skilled workers in the manufacturing industry
    1. **Supervisors.** These workers oversee the fabrication and production of products. Supervisors are involved with scheduling production and overseeing line working, inventory, and so on.
    2. **Testers.** These workers are responsible for testing the product to see if it works properly and safely.

H. Examples of semiskilled workers in the manufacturing industry
    1. **apprenticeship workers** who assist plumbers, electricians, and so forth
    2. an **operator** of machinery or equipment that does not require lengthy preparation or completion of an apprenticeship program

I. Examples of nonskilled workers in the manufacturing industry are **laborers** who might assist skilled manufacturing workers on the job.

IV. Youth leadership

A. Using personnel/leadership development systems (Transparency M3-9)
    1. All organizations use systems to manage group activities.
    2. The duties of personnel who hold various positions in the system rely on the total group working together for the benefit of all in the organization. (Transparency M3-10)
    3. The personnel system is made up of officers and committees that are responsible for carrying out the duties and responsibilities of the organization. (Transparency M3-11)
    4. It is important for students to work together and to develop leadership skills. (Transparency M3-12)
    5. Democratic decision making is developed through the process of conducting meetings and learning how to make motions in those meetings. (Transparency M3-13 and M3-14)

B. Using industrial community resources (Transparency M3-15)
    1. Making contacts with community and industrial leaders will help develop leadership skills.

   2. Part of leadership development is learning how to survey industry and to use a questionnaire during an interview.
   3. Community resources are an extension of the industrial arts classroom. They allow students a more in-depth exposure to personnel/leadership development.

C. Providing a school or community service (Transparency M3-16)
   1. Service or community projects provide benefits to others and to those who provide them.
   2. Service projects enable students to use their technical know-how to help others in the same way that inventions help solve problems.

D. Enterprising a product or service (Transparency M3-17)
   1. In the United States, the industrial system is called free enterprise. This means that we are free to establish any kind of business or to make almost any product we desire.
   2. Through free enterprise, companies are encouraged to produce new products that are protected by patents.
   3. Products are sold for their economic value, and services are provided for their economic value.

E. Recognizing student achievements (Transparency M3-18)
   1. AIASA contests and booth exhibits provide opportunities for students to develop leadership skills through competing and interacting with other students on regional, state, and national levels. (Transparency M3-19)
   2. Through the various contests and exhibits, students will be recognized for outstanding individual and chapter work.

MATERIALS FOR STUDENTS

- Vocabulary worksheet
- Format for Collecting Career Information
- Field Trip Observation Form
- Entry-level Employment Requirements
- AIASA Materials
- Job Application Form

SUGGESTED STUDENT ACTIVITIES

1. Have students determine which local companies employ the various occupations in the manufacturing industry.
2. Have students conduct research on new jobs that have been created through recent technological advances.
3. Invite an individual or panel of resource persons to discuss the types of work done in their jobs in the manufacturing industry. If arrangements cannot be made to have resource persons visit your classes, videotape these workers on-site, using your students.
4. Investigate the instruments, tools, and equipment needed by a person who is starting in the various technical and skilled jobs.
5. Discuss safety in relationship to the various occupations, which jobs might be hazardous, and other safety issues.
6. Take a field trip to a manufacturing site, and observe the employees at work.
7. View training films or other visuals available on careers in the manufacturing industry.
8. Have a personnel director or recruiter talk to your classes, or videotape this presentation to show to your classes.

9. With the help of your students, videotape on-site activities of engineers, chemists, statisticians, technicians, drafters, technical writers, supervisors, or testers to show on-site career information.
10. Conduct a survey in the various occupations to determine the male/female ratio. Also try to determine the trends in the increasing roles and responsibilities in the manufacturing field.
11. Have students select occupations that interest them. Fill out the career information forms using various references.
12. Invite a resource person from OSHA to present to the class information on health and safety as they relate to "manufacturing" occupations.
13. Have the students organize a manufacturing company to produce a product or service. Have the students apply for the various jobs in the company, fill out job application forms, and interview for those positions. Videotape the interviews so the students can see how well they did during the interview. You can use your principal, vocational administrator, or a personnel director from a local business to interview the students.
14. Students will participate in discussions of the various positions in the personnel/leadership system. After election to an office or committee position, they will practice the duties. Their duties will help them conduct class meetings and manage laboratory activities. During class meetings, the students will use parliamentary procedures to make democratic decisions.
15. All students will study the transparencies describing the personnel system used in the class.
16. A nominating committee will be formed to work with the teacher and to prepare ballots.
17. Students elected to office and committee positions will study duties and learn how to conduct a meeting.
18. Parliamentary procedures will be learned so that motions are used by all students.
19. Class officers will conduct a meeting to decide which industrial and community resources will be used to learn a certain unit of industrial arts. A community resource committee will meet to list and select appropriate speakers or industrial tours. The class will vote on the best resource. With the help of the teacher and the principal, the speaker is called or a letter is written. If all students are not permitted to visit the industry, the committee may visit, videotape the industry, and report to the class. After the visit, a "thank you" letter should be written to the persons who assisted the class or committee.
20. **Class officers:** Conduct a class meeting in which the teacher will give a lesson on **Using Community Resources.** An historian serves on the committee. After the committee selects the appropriate resources, the officers will conduct a meeting to select one. The officers will announce when the next class meeting will be held to allow time for this activity.
21. **Committee members:** (1) Use library or Chamber of Commerce directories or Yellow Pages to find a business or industry related to a unit of study. (2) After the class votes on the best resource, the committee writes a letter to invite a speaker or arrange a tour. (3) The parliamentarian obtains permission forms from the principal's office, if required. (4) Follow-up is made to check on arrangements. (5) If the class is not permitted to visit the industry, the committee may visit and videotape the tour for the class. (6) A "thank you" letter is written to the speaker or industry. (7) Records are kept in a file for use by other classes or school chapters.
22. Class officers will conduct a class meeting to decide which service project will be provided by the class to help the school or community. A service committee will organize the project and involve class members in laboratory work to complete the project for delivery or pickup.

23. Class officers will conduct a meeting to decide which product or service will be of economic value to the class or AIASA. The class will work as a group to form the enterprise. An enterprise committee will organize technical and financial details for the class members. The entire class will work to make a profit for the class or to pay for AIASA dues or other activity.
24. Class officers will conduct a meeting to decide which contests will provide recognition for student achievements. A recognition committee will organize contests, exhibits, or demonstrations for the class. Class members will compete with each other or work together on a recognition event, such as an open house.

Vocabulary Worksheet

1. personnel system
2. decision making
3. vendor
4. enterprise
5. organize
6. manage
7. technical
8. professional worker
9. technical worker
10. skilled worker
11. semiskilled worker
12. nonskilled worker
13. industrial and commercial resources
14. hiring
15. training
16. advancing
17. retraining

18. demoting

19. retiring

20. career

TEST

Unit 3: Personnel Management

Directions: Read each statement carefully. Select the word or phrase that correctly answers or completes the statement, and write the appropriate letter in the blank.

Example: __D__ 21. The class that you are in is—

A. Health
B. Science
C. Math
D. Industrial Arts

___ 1. Most people work an average of—

A. 5 to 10 years
B. 10 to 20 years
C. 25 to 45 years
D. 45 to 75 years

___ 2. The first step in choosing a career is to—

A. consider the vast variety of careers that exist
B. get information about worker's compensation
C. get advanced degrees
D. go out and get a job

___ 3. The highest level of the occupational ladder is—

A. technical
B. professional
C. skilled
D. semiskilled

___ 4. Which of the following reasons leads to workers being demoted or fired?

A. following instructions
B. being interested in the job
C. working overtime
D. absenteeism

___ 5. The lowest level of the occupational ladder is—

A. professional
B. nonskilled
C. skilled
D. semiskilled

___ 6. Being a skilled worker requires—

A. lengthy preparation through on-the-job training
B. an advanced degree
C. a college degree
D. no experience

___ 7. Semiskilled workers require—

A. no experience
B. little or no experience
C. little or no preparation
D. considerable preparation through on-the-job training

___ 8. Technical workers require—

A. a college degree
B. lengthy on-the-job training
C. some college and/or technical training
D. little or no preparation

___ 9. The industrial system in the United States is called—

A. free enterprise
B. capitalism
C. communism
D. barter

___ 10. Manufacturing occupations include—

A. supervisors
B. engineers
C. technicians
D. all of the above

HOW TO APPLY FOR A JOB

SOURCES OF JOBS

1. PUBLIC EMPLOYMENT COMMISSIONS
2. PRIVATE EMPLOYMENT AGENCIES
3. EDUCATION AND MANPOWER SCHOOLS/FACILITIES
4. NEWSPAPERS, MAGAZINES, GOVERNMENT PUBLICATIONS, ETC.
5. WORD OF MOUTH

LETTER OF APPLICATION

1. A NEAT, LEGIBLE LETTER OF APPLICATION SHOWS ORGANIZATION AND CONCISENESS ON YOUR PART.
2. INCLUDE DETAILS THAT WOULD BE OF INTEREST TO A PROSPECTIVE EMPLOYER.
3. YOUR LETTER SHOULD BE SO CONVINCING THAT THE EMPLOYER WILL WANT TO TALK TO YOU PERSONALLY.

APPLICATION FORM

1. HAVE BACKGROUND INFORMATION AND DATES AVAILABLE WHEN YOU FILL OUT AN APPLICATION FORM AT ANY PLACE OF BUSINESS.
2. ALWAYS FILL OUT ALL BLANKS ON AN APPLICATION FORM.
3. FOLLOW ALL DIRECTIONS WHEN FILLING OUT AN APPLICATION FORM.

APPLICATION FOR EMPLOYMENT

OFFICE OF PERSONNEL SERVICES
AND EMPLOYEE RELATIONS
2613 Wichita St. P. O. Drawer V
Austin, Texas 78712-7449 (512) 471-3856

IMPORTANT INSTRUCTIONS: (1) Print all information using a #2 pencil. (2) Answer *all* questions completely. (3) A resume will not substitute for this application.

DATE

WHEN COULD YOU START WORK?

FULL-TIME ☐ PART-TIME ☐

LOWEST MONTHLY SALARY YOU WOULD ACCEPT

ARE YOU SEEKING TEMPORARY EMPLOYMENT? YES ☐ NO ☐

IF YES, HOW LONG? ____________

PRINT NAME: LAST FIRST MIDDLE

SOCIAL SECURITY NUMBER

PRESENT ADDRESS: STREET & NUMBER CITY STATE ZIP CODE

TELEPHONE NUMBER: Home Office

IF YOUR AGE IS BELOW 18 YEARS, OR IS 70 YEARS OR ABOVE, GIVE DATE OF BIRTH

MALE ☐ FEMALE ☐

ARE YOU A UNITED STATES CITIZEN? YES ☐ NO ☐

HAVE YOU EVER BEEN EMPLOYED WITH THE UNIVERSITY OF TEXAS AT AUSTIN? YES ☐ NO ☐

IF YES, WHEN? ____________

HAVE YOU EVER RECEIVED WORKERS' COMPENSATION PAYMENTS FOR WORK RELATED INJURIES? YES ☐ NO ☐

IF YES, GIVE DATE OF INJURY, AND THE EMPLOYER'S NAME AND ADDRESS ____________

ARE YOU RELATED BY KINSHIP OR MARRIAGE TO ANY CURRENT EMPLOYEE OR TO ANY MEMBER OF THE BOARD OF REGENTS OF THE UNIVERSITY OF TEXAS SYSTEM? YES ☐ NO ☐

IF YES, GIVE NAME AND RELATIONSHIP ____________

HAVE YOU EVER BEEN CONVICTED OF A VIOLATION OF ANY LOCAL, STATE, OR FEDERAL LAW (OTHER THAN MINOR TRAFFIC VIOLATIONS)? YES ☐ NO ☐

IF YES, GIVE DATE(S) AND NATURE OF CONVICTION(S) ____________

HOW WERE YOU REFERRED TO THIS OFFICE?
SELF ☐ FRIEND ☐ U.T. EMPLOYEE ☐ T.E.C. ☐
ADVERTISEMENT ☐ OTHER ☐: SPECIFY ____________

EDUCATION: Circle the total number of years of education that you have completed (elementary through college).

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Check if you have a GED ⟶ ☐

NAME AND LOCATION OF SCHOOL	FROM Month & Year	TO Month & Year	DID YOU GRADUATE?	HOURS OF CREDIT	TYPE OF DEGREE	MAJOR	SEMESTER HOURS OF CREDIT IN MAJOR
HIGH SCHOOL							
COLLEGE OR UNIVERSITY							
OTHER FORMAL TRAINING							

DO YOU HAVE A CURRENT DRIVER'S LICENSE? YES ☐ NO ☐

IF YES, WHAT KIND? CHAUFFEUR ☐ COMMERCIAL ☐ OPERATOR ☐ WHAT STATE? ____________

LIST OTHER LICENSES, CERTIFICATIONS, OR REGISTRATIONS (PROFESSIONAL, TECHNICAL, OR OTHERWISE) WHICH YOU POSSESS

LIST THE LANGUAGES, BESIDES ENGLISH, WHICH YOU SPEAK, READ, OR WRITE, AND YOUR FLUENCY IN EACH LANGUAGE

FOR PERSONNEL OFFICE USE ONLY

SPELLING ____________ ( ) TYPING ____________ ( ) SHORTHAND ____________ ( )

BEST COPY AVAILABLE

EXPERIENCE — Start with your present or last position and work back. List all work experience including U.T. experience and military experience. Be specific when listing your job duties.

List any other names under which you have been employed.

NAME OF EMPLOYER
STREET ADDRESS
CITY AND STATE
TELEPHONE
NAME AND TITLE OF IMMEDIATE SUPERVISOR
REASON FOR LEAVING

FROM		TO	
Month	Year	Month	Year

LIST EACH JOB TITLE THAT YOU HELD, TIME SPENT AT EACH TITLE, AND JOB DUTIES AT EACH TITLE

MONTHLY SALARY
START $ END $
AVERAGE NUMBER OF HOURS YOU WORKED EACH WEEK
HOW MANY DID YOU SUPERVISE, IF ANY?

NAME OF EMPLOYER
STREET ADDRESS
CITY AND STATE
TELEPHONE
NAME AND TITLE OF IMMEDIATE SUPERVISOR
REASON FOR LEAVING

FROM		TO	
Month	Year	Month	Year

LIST EACH JOB TITLE THAT YOU HELD, TIME SPENT AT EACH TITLE, AND JOB DUTIES AT EACH TITLE

MONTHLY SALARY
START $ END $
AVERAGE NUMBER OF HOURS YOU WORKED EACH WEEK
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NAME OF EMPLOYER
STREET ADDRESS
CITY AND STATE
TELEPHONE
NAME AND TITLE OF IMMEDIATE SUPERVISOR
REASON FOR LEAVING

FROM		TO	
Month	Year	Month	Year

LIST EACH JOB TITLE THAT YOU HELD, TIME SPENT AT EACH TITLE, AND JOB DUTIES AT EACH TITLE

MONTHLY SALARY
START $ END $
AVERAGE NUMBER OF HOURS YOU WORKED EACH WEEK
HOW MANY DID YOU SUPERVISE, IF ANY?

NAME OF EMPLOYER
STREET ADDRESS
CITY AND STATE
TELEPHONE
NAME AND TITLE OF IMMEDIATE SUPERVISOR
REASON FOR LEAVING

FROM		TO	
Month	Year	Month	Year

LIST EACH JOB TITLE THAT YOU HELD, TIME SPENT AT EACH TITLE, AND JOB DUTIES AT EACH TITLE

MONTHLY SALARY
START $ END $
AVERAGE NUMBER OF HOURS YOU WORKED EACH WEEK
HOW MANY DID YOU SUPERVISE, IF ANY?

ASK FOR AN ADDITIONAL SHEET IF YOU NEED TO LIST OTHER JOBS THAT YOU HAVE HELD.

I certify that the statements made by me in this application are true, complete, and correct to the best of my knowledge and belief and are made in good faith. I understand that any false statements made herein will void this application and any actions based on it. I understand that any offer of employment tendered me is contingent upon my agreement to abide by the rules and regulations of the Board of Regents of the University of Texas System.

SIGNATURE OF APPLICANT ______________________ DATE ______________

BEST COPY AVAILABLE

INTERVIEWING FOR A JOB

1. YOUR APPEARANCE SHOULD BE NEAT.
2. YOU SHOULD HAVE A POSITIVE ATTITUDE.
3. YOU SHOULD ARRIVE AT THE INTERVIEW APPROXIMATELY 15 MINUTES BEFORE YOUR INTERVIEW IS SCHEDULED.
4. YOU SHOULD BE POLITE, COURTEOUS, AND HONEST DURING THE INTERVIEW.
5. YOU SHOULD BE ENTHUSED ABOUT THE JOB FOR WHICH YOU ARE APPLYING.
6. YOU NEED TO COMMUNICATE WELL WITH THE INTERVIEWER.

REASONS FOR HIRING AN APPLICANT

1. PREVIOUS WORK EXPERIENCE
2. INTEREST IN THE SPECIFIC JOB
3. RECOMMENDATIONS FROM PREVIOUS EMPLOYERS
4. TRAINING BACKGROUND
5. PERSONAL APPEARANCE
6. MANNERS AND MANNERISMS
7. PERSONALITY
8. AMBITION
9. MATURITY
10. EDUCATIONAL BACKGROUND

Format for Collecting Career Information

Most people work an average of 25 to 45 years – an important part of one's life. Jobs are growing increasingly specialized in almost every field. New technologies are creating a demand for highly skilled men and women. As a result, employers are putting a premium on specific skills. Career planning is becoming essential.

The first step in choosing a career is to consider the vast variety of careers in existence today. The student should talk to the teacher about career possibilities, then collect information about a possible career choice using the following suggested points:

1. What is my interest? (career to be studied)
2. What is the beginning salary? (Check with employers.)
3. Is the career open for advancement? (Where does it lead?)
4. Is there a need for this career? (Get long-range projection of demand.)
5. Where are the jobs located in this career? (Are the jobs clustered in specific areas?)
6. What kind of work does a person do in this occupation? (Get work duties and environment.)
7. What level of education is needed in order to qualify for this career? (How long does it take?)

This guide could be used with the techniques of interview, bulletin boards, reports, and class discussions.

Field Trip Observation Form

STUDENT NAME ______________________________

I. **Job title** ______________________________

II. **Description of major job duties** (please list):

A. ______________________________
B. ______________________________
C. ______________________________
D. ______________________________
E. ______________________________

III. **Job characteristics.** Check those which apply to a worker in this occupation:

______ A. able to see physical results of work
______ B. competitive – must compete for advancement
______ C. directs activities of others – supervisory
______ D. helps people
______ E. high level of responsibility
______ F. motivates others – must have ability to influence others
______ G. repetitious work
______ H. requires physical stamina
______ I. self-expression encouraged
______ J. closely supervised by superiors
______ K. works with technical data
______ L. works with people
______ M. works alone
______ N. manual skills required

IV. **Educational requirements.** Check level required for this occupation:

______ A. high school education desirable
______ B. high school education required
______ C. junior college or trade school
______ D. four-year college – baccalaureate
______ E. advanced degree – master's
______ F. advanced degree – doctorate

Entry-Level Employment Requirements

1. Name of business ______________________________

2. Position ______________________________

3. To obtain entry-level employment in this position, the following skills are required or recommended:

   Education and training

   Personal requirements and desirable traits

   Other

By ____________ Position or Title ______________________________
Name

Resource Person Information Sheet

Resource Person: ________________ **Date:** ________________
Occupational Area: ________________ **Your Name:** ________________

1. List typical jobs within the occupational area:
2. Job responsibilities:
3. Working conditions:
4. Personality traits needed for occupational area:
5. Education and/or training required:
6. Advantages and disadvantages of occupational field:
7. Advancement opportunities in this occupational field:
8. Salary range (approximate starting to estimated maximum):
9. Your personal reaction to this occupational area as described by the speaker:
10. Describe your reaction to this speaker, and make recommendations for improvement:

The Student Association as Personnel System with Uniform Titles

All Industrial Arts courses benefit from a personnel system used to manage the classroom or laboratory activities of students. Personnel management is a function of any organization whether it be a class of students, corporation of employees or an association of volunteers. Most Industrial Arts personnel systems differ as to the titles of each position in the system. Using AIASA related titles in the personnel system will both manage the class, as well as, give students experience with a group organization.

Officers in a democratic organization are best selected by the members of the group. Thus, the teacher may ask the class to nominate persons for election as key management officers. Teachers using any of the titles on the left are encouraged to utilize the uniform title in the right column.

Current Title	Should Have This Uniform Title
General Manager Lab Supervisor Superintendent Project Director	PRESIDENT
Manager's Assistant Assistant Supervisor Co-Director Production Manager	VICE PRESIDENT
Roll Keeper Recordkeeper Letterwriter	SECRETARY
Accountant Purchasing Agent Supply Clerk Bookkeeper	TREASURER
Safety Director Attorney or Lawyer Contract Officer Permission Coordinator Inspector	PARLIAMENTARIAN
Clean-up Supervisor	SERGEANT-AT-ARMS
Public Relations Director Advertising Agent Publicity Director	REPORTER
Education Director Final Report Writer Scrapbook Manager Librarian	HISTORIAN

AIASA PERSONNEL IN-CLASS DUTIES

PRESIDENT (Students Name)

1. Leader of personnel system.
2. Calls clean-up.
3. Conducts class meetings.
4. Receives ideas and reports from the class members.
5. Suggests any possible lab improvements gained through experience.
6. Responsible for the assignment or election of new personnel.

VICE PRESIDENT (STUDENTS NAME)

1. Familiar with duties of President.
2. Substitutes for President.
3. Assists President as second level manager.
4. Helps follow-up committee work.
5. Helps other officers if absent or behind.
6. Makes organizational chart for class.

SECRETARY

1. Takes roll, makes slip of those absent for teacher.
2. Keeps Minutes of class decisions for reading at next meeting.
3. Records list of officers and committee personnel.
4. Prepares agenda for seminar or class meetings.
5. Sends letters when necessary.

TREASURER

1. Collects routine fees or AIASA dues.
2. Checks names of students who pay and writes receipt.
3. Charge students for use of supplies.
4. Helps teacher order supplies.
5. Cleans supply room.
6. Reports progresses of supply payment or purchases at meetings.
7. Serves on Enterprising Committee of class.

PARLIAMENTARIAN

1. Is responsible for general safety procedures.
2. Posts safety posters and information.
3. Files safety test records.
4. Inventories first aid supplies and notifies instructor when additional supplies are needed.
5. Reports any injuries to the instructor.
6. Helps President with motions and rules of class.
7. Serves on School/Community Service Committee of class.

SERGEANT AT ARMS

1. Oversees all clean-up personnel.
2. Makes substitutions for absent clean-up personnel.
3. Improvises and receives ideas for improving clean-up.
4. Reports to President and teacher when the clean-up is completed.
5. Prepares room for class meetings.
6. May serve as Quality Control or Union Steward.

REPORTER

1. Reports to class on the progress of activities.
2. Prepares bulletin board or displays related to class activities or school AIASA.
3. Writes articles or makes photos for school newspaper.
4. Welcomes visitors and explains classwork.
5. Cleans darkroom if available.
6. Advertises projects or services of class.
7. Serves on Recognition Committee of class.

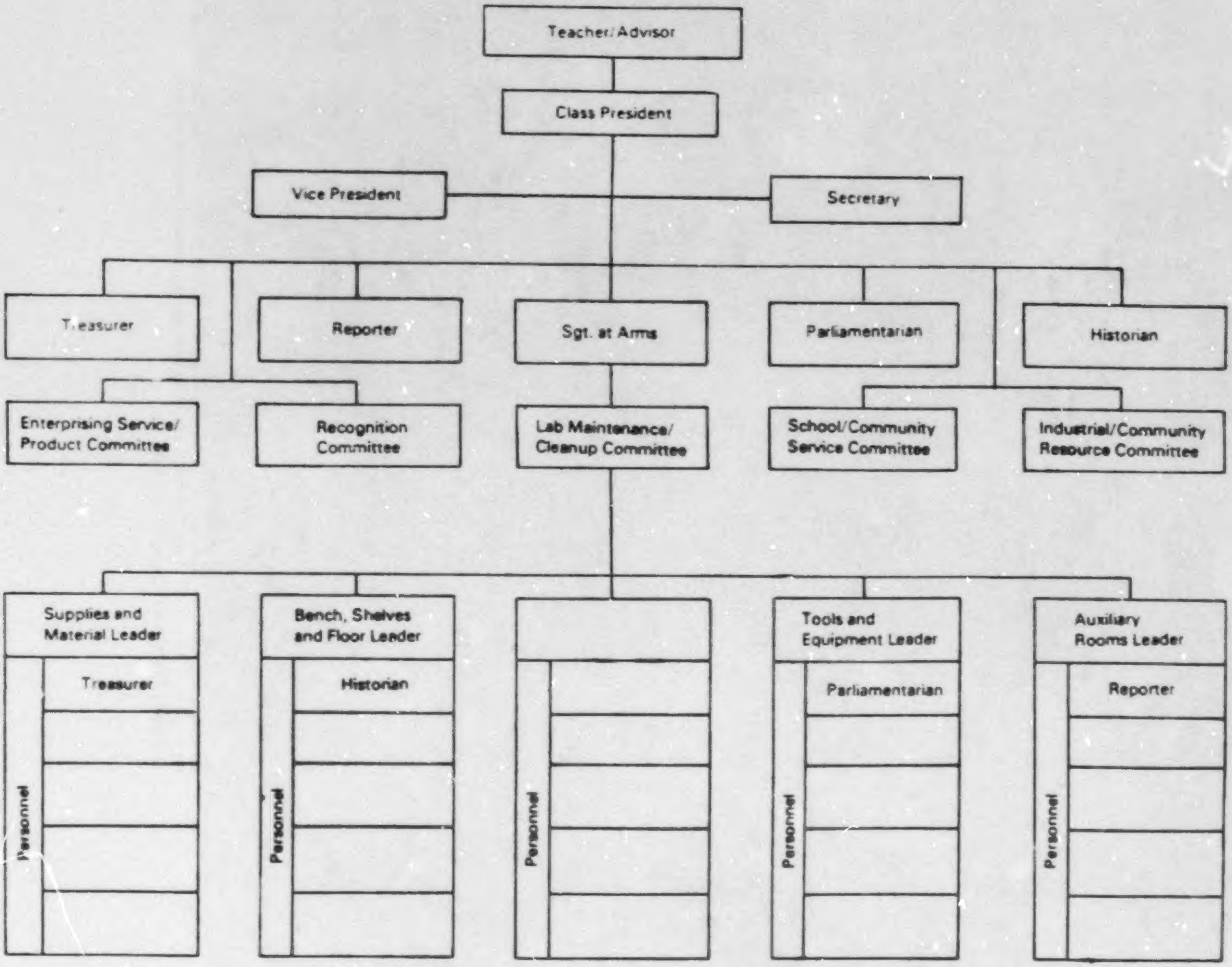
HISTORIAN

1. Picks up homework or assignments for teacher.
2. Checks off work turned in by class members.
3. Assembles group reports.
4. Keeps notebooks, files or scrapbook up-to-date.
5. Cleans books and reference area of class during cloud
6. Photographs activities.
7. Serves on Industrial Resource Committee of class.

COMMITTEE DUTIES

LABORATORY MAINTENANCE/ CLEANUP COMMITTEE	1. Sgt. at arms and officers appoint or rotate personnel to each position. 2. All students in class have duties or either as leader or worker in one of these areas: (1) Supplies and reference materials (2) Tools, equipment and machines (3) Auxiliary Rooms (4) Others (determined by teacher) 3. Workers report completion of duties to chairperson, leader, or sgt. at arms. 4. President, Sgt. at arms or teacher dismisses class at proper time.
INDUSTRIAL/COMMUNITY RESOURCE COMMITTEE	1. Make list of industrial or community resources related to course. 2. With teacher, select 3 helpful to unit of study. 3. Report resources available at class meetings for vote. 4. Arrange speakers or visits for class. 5. Send thank you letters.
SCHOOL/COMMUNITY SERVICE COMMITTEE	1. Make list of classroom, school or community service projects related to course. 2. With teacher, select 3 related to technical unit of study. 3. Review requests from others for services. 4. Report possible projects at class meetings for vote. 5. Organize class for work to be done. 6. Deliver service to appropriate person or group.
ENTERPRISING SERVICE OR PRODUCT COMMITTEE	1. Make list of products or services of economic value related to course. 2. Make prototypes of those related to unit of study. 3. Report possible products or services to class meetings for vote. 4. Organize company for production or service enterprise. 5. Keep financial records and report to class. 6. Present income for AIASA purpose to Treasurer.
RECOGNITION OF ACHIEVEMENT COMMITTEE	1. Make list of regular AIASA contests and others related to course. 2. With teacher, select or develop contests related to unit of study. 3. Report at class meetings on contests to be used. 4. Organize contest procedures and awards to be given. 5. Recognize winners with awards and newspaper articles.

ORGANIZATIONAL STRUCTURE


Teacher/Advisor
Class President
Vice President
Secretary
Treasurer
Reporter
Sgt. at Arms
Parliamentarian
Historian
Enterprising Service/ Product Committee
Recognition Committee
Lab Maintenance/ Cleanup Committee
School/Community Service Committee
Industrial/Community Resource Committee
Supplies and Material Leader
Treasurer
Personnel
Bench, Shelves and Floor Leader
Historian
Personnel
Personnel
Tools and Equipment Leader
Parliamentarian
Personnel
Auxiliary Rooms Leader
Reporter
Personnel

In-Class Meeting Procedures

Many of the routine activities of an industrial arts class can be handled by the officers of the class's student association. The **Class Meeting Agenda** should be in front of the students as poster to help each student understand meeting procedures.

1. Call to Order

President:	Raps gavel twice before saying - **Will the (class or meeting) please come to order? Sergeant At Arms, are there enough members present and in their seats to have a meeting?**
Sgt. at Arms:	**There are, (Mr. or Miss) President.** Tells students who arrive late to see Secretary for roll check.

2. Hear the Minutes of the Previous Meeting

President:	**We are ready to transact our business. Will the Secretary please read the Minutes?**
Secretary:	The Secretary stands and reads the Minutes which include date, time and place motions and other details of the last meeting.
President:	After the reading of the Minutes asks: **Are there any corrections or additions to the Minutes? (If none, the Minutes stand approved as read, or the Minutes stand approved as corrected.)**

3. Hear Reports of Officers or Standing Committees

President:	**The Assembly will hear reports of Officers.** (After each report, may ask; **You have heard the report. What is your pleasure?** For approval or adoption by motion?
Treasurer:	**The following amounts have been paid as (fees or dues) to the Treasurer $__________.** The amount of $________has been paid out. The total balance is $________. The Treasurer may announce any fees to be paid or information about supplies.
Historian:	(May call for homework or assignments as part of group effort.)
Sgt. at Arms:	(May report on clean-up changes and condition of classroom and laboratories.)
Parliamentarian:	(May report or advise on procedures used for meeting or laboratory safety.)
Secretary:	(May report attendance information and give list of absent students to teacher.)
President:	**Do any Committees have reports?**
Maintenance Comm:	May report or advise.
Service Committee:	May report or advise.
Enterprising Comm:	May report or advise.
Resources Comm:	May report or advise.
Recognition Comm:	May report or advise.
President:	After each report say, **You have heard the report. What is your pleasure?**

4. Hear Reports of Special Committees

President:	**We will hear the report of the special committee for ____________________.**
Special Comm:	May report or advise.
President:	**You have heard the report. What is your pleasure?**

5. Hear Announcements

President:	**Are there any announcements to be made at this time?**
Reporter:	May report on class progress or outside events of interest to class or school AIASA.
Open to the Floor:	Other students may announce any meetings, activities or events scheduled in the future.
Teacher:	May wish to make announcements also.

6. Unfinished Business

President:	**The floor is open for discussion of unfinished business of the last meeting.**
Secretary or Parliamentarian:	May call attention to tabled motions or details from minutes of previous meetings.
Historian:	May remind members of homework or reports assigned or collect papers for teacher.

7. New Business

President:	**The floor is open for discussion of new business.**
Open to the Floor:	Suggestions for action not discussed before at the meeting would be introduced.
President:	(When the President feels that the discussion is complete, ask:) **Does anyone desire to make a motion?** (President acts on motion, appoints a committee or calls for another new business, or may call on the teacher (Mr., Miss, Mrs. ________, do we have a lesson?)
Teacher:	Presents lesson or announces laboratory work.

8. Adjournment of the Meeting

President:	Raps gavel twice. **If there is not further business, the meeting stands ready to adjourn.** Raps gavel 3 times. **What is our motto?**
All:	**"Learning to Live in a Technical World."**
President:	**Does anyone wish to introduce a motion to adjourn?** (Conduct vote on motion and declare adjournment) or say; Does anyone know of any reason why this assembly should not adjourn? **I declare this meeting adjourned.**

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HOW MOTIONS ARE MADE

HOW TO PRESENT A MOTION

There are eight simple steps in presenting a main motion:

1. The member rises and addresses the President.
2. The member is recognized by the President.
3. The member states his idea as a motion.
4. Another member seconds the motion.
5. The motion is restated by the President.
6. The Presidents conducts the discussion.
7. The President puts the question to a vote.
8. The President announces the result.

The main motion forms the starting point for any action to be taken by the group. Informal discussion may be allowed in small groups, but to be considered, the motion must be made, seconded, and stated by the President.

The President should know the exact moment at which to stop any informal discussion. He may bring things to a head by saying:

"If **definite action is sought in this matter, a motion is in order.**"

This is how a motion is made:

1. Stand and address the President: "**Mr. or Ms. President.**" Wait until you are recognized by the President. Do not speak until you are recognized by a nod or by name.

2. Be sure you have your motion clearly in mind, and worded as briefly as possible. Write it out if you can.

3. When you have been recognized, state the motion so that all can hear: "**I move that this chapter give a rising vote of thanks to its sponsor, Mr. Gardner.**"

4. After the motion has been made, another member, without waiting to be recognized, calls out: "**I second the motion.**"

5. The motion having been made and seconded, the President states the motion by saying: "**It has been moved and seconded that this chapter give a rising vote of thanks to its sponsor, Mr. Gardner.**"

6. When the chairman has stated the motion, it is said to be pending. It may now be considered by the group — that is, it is open to discussion and debate.

7. Any member may now rise to agree or disagree with the proposal. For example, a member may rise and say: "**Mr. or Ms. President.**" The President says: "**Ron,**" so giving him permission to speak. "**I agree with the motion. Mr. Gardner has given his time to us and we should express our gratitude to him.**"

8. The President inquires: "**Is there any further discussion?**" Since no one rises to discuss the motion further, the President asks, "**Are you ready for the question?**" (The "question" is the vote.) The members call out, "**Question?**"

9. The President then puts the question — that is, he takes the vote. He or she says: "**It has been moved and seconded that this chapter give a rising vote of thanks to its sponsor, Mr. Gardner. All those in favor of the motion say 'Aye.'**"
   The members in favor of the motion say, "**Aye.**"
   The President then says: "**Those opposed, say 'No.'**"

10. The President then announces the vote: "**The Ayes have it. The motion is carried.**" Or, "**The Noes have it. The motion is defeated.**"

KINDS OF MOTIONS

There are four kinds of motions:

1. Privileged motion
2. Subsidiary motion
3. Incidental motion
4. Main motion

Motions that concern the rights and privileges of members are called privileged motions. **Because of their urgency and importance they come before all other motions.** The most common privileged motions are:

1. To fix time and place for adjournment.
2. To adjourn.
3. To take a recess.
4. Matters of personal privilege.
5. Orders of the day.

You will notice that four of these motions concern general rights. They are rights reserved to the chapter: when to adjourn, when to recess and when to insist that the rules be followed. The other motion, the motion of privilege, is the most important. It refers to a member's individual and personal rights.

Let us take an example of how this motion actually works.

Whenever there is any disturbance to the assembly, such as noise, presence of non-members, quarrels between members, or unpleasant atmospheric conditions, like excessive heat or cold, you may rise to a question of privilege. Suppose there is so much noise that you cannot hear. You might stand, and without waiting to be recognized, say: "**Mr. or Ms. President, I rise to a point of personal privilege.**"

The President would then tell you to state your point of privilege. You might say, "**There is too much noise. I can't hear.**"

Motions of personal privilege require no second, and are immediately decided by the President. In this case, he/she might direct the speaker to talk more loudly or he might take some other measure, such as closing the windows to shut out the disturbance. Business would then be resumed.

Subsidiary motions amend or otherwise dispose of other motions. There are seven of them. The two you may want to use, however, are (1) to refer to a committee, and (2) to amend.

You use the refer to a committee motion whenever you feel that the chapter should study the proposition more carefully before voting on it. You rise and say, "**Mr. or Miss President.**"

When recognized, you then say: "**I move that this question be referred to a committee.**"

This motion must be seconded. It can be amended. It can be debated. It cannot be reconsidered once the committee has begun its study. It requires a majority vote.

The motion to amend seeks to modify or change the motion under consideration. When you wish to make it, you must rise and say, "**Mr. or Ms. President.**"

When you have been recognized by the President, you might say, "**I move to amend the motion by striking out the word 'annual.'**"

When you make this motion, you must be sure to state definitely the way in which you want the amendment made.

Motions that arise out of debate are called incidental motions. They are concerned with small matters that can readily be settled. For example, a member desires to know some matter of information (point of information) or a member desires to question a vote (divide the assembly), or a member desires to know if the proper procedure is being followed (point of order).

A main motion brings a new proposal before the chapter. It is only in order when no other main motion is being debated.

A main motion is subject to six conditions:

1. It must be seconded.
2. It can be amended.
3. It can be debated.
4. It can be reconsidered — that is, brought up a second time.
5. It can have additional motions that change it.
6. It requires a majority vote.

DUTIES FOR IN-CLASS USE OF COMMUNITY RESOURCES

This activity will help students learn how to invite and properly use a guest speaker in the Industrial Arts class. The particular content of the course or lesson will determine the type of resource person who should be contacted. The student learns to call, talk with, write letter, and introduce a speaker as part of classroom instruction.

Officer and Committee Duties

Community Resources Committee	This committee of the class meets often during the semester to find ways for industry and community resources to be used for the Industrial Arts class or laboratory. Types of resources include speakers, field trips and laboratory materials which help class with chosen activity. Teacher may suggest possible speakers related to technical or career aspects of the course.
President	Opens meeting to hear report of Community Resources Committee and involve class in deciding resources for class to use. Relatives, friends, industrial workers or business leaders may be suggested by class members. Class votes to use a resource in cooperation with teacher and school office.
Vice president	May prepare sample questions for class members to ask speaker.
Secretary	Records suggested names of community resources and records any decisions made by class.
Treasurer	Most speakers will not require any financial assistance, however, if near lunch period the class may ask person to stay for lunch at school.
Parliamentarian	Helps class use proper procedures for inviting, talking to and thanking a resource speaker.
Reporter	Assures speaker will be met by committee or officer. Obtains information about speaker to announce to other teachers if appropriate.
Sgt. at Arms	Assures speaker is not interrupted while talking with class.
Historian	Records or videotapes speaker so speech can be saved for use with other classes.

TYPICAL SCHEDULE FOR USING A SPEAKER

class Meeting 1.	Teacher explains that there are various resource persons in the community who could speak to the class and help them learn additional information.
2&3.	Students survey community for resources related to the topics of the course.
4.	Industrial/Community Resource Committee reports to class on those resource person they have considered good for the course content.
	Class officers conduct meeting of class to vote on one person to invite to speak.
5.	Committee writes letter to invite resource person giving dates suggested by teacher and with approval of principal's office.
6&7.	Committee prepares questions and gathers information related to speaker or the industry.
8.	Teacher follows up letter by calling the speaker to discuss dates, times, topic and school policies related to outside speakers.
Day of Speaker –	Committee meets speaker at arrival time and introduces speaker to principal, teacher and class. (Other teachers or classes may also attend.)
	Class members ask questions at appropriate time. Other committees or groups may seek advice on their activities or projects using the resource person as a consultant.
After speech	Reporter writes news story about speaker and talk.
	Thank you letter is written to speaker.
	Recordings of speech are shared with other classes or information is filed so that speaker can be invited again.

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DUTIES FOR IN-CLASS SERVICE PROJECTS

This activity will use the procedures of the "Group Project" method which begins on Page 49 of the **Exploring Technology Guide**. This method uses "student involvement, interaction and skills to produce one or more tangible products . . ." Leadership and followership are developed as students work together in the laboratory as one industry to produce a product.

Officer and Committee Duties

Service Committee:	Meets to screen or encourage and select a service project for the class to build.
President:	Opens meeting to hear report of Service Committee and involve class in decision. Class votes on service to be provided to another group.
Vice-president:	Reproduces organizational chart for group project system and asks class to determine who will take each position.
Secretary:	Keeps minutes of class meeting and records names of students who are members of group project.
Treasurer:	Advises class on financial details related to service project.
Parliamentarian:	Advises class on proper procedures for obtaining permission.
Sgt at Arms:	May suggest services or improvements needed within laboratory such as tool holders or safety devices.
Reporter:	Writes story about plans of class to build a service project to help others. Takes photos of work and delivery for story.
Historian:	May share information on previous projects related to this one. Keeps records for other classes to use for reference.

TYPICAL SERVICE PROJECT SCHEDULE

Class Meeting 1 Teacher explains group project method to class and students discuss possible service projects for Service Committee to consider.

2. Service Committee reports to class a recommended service project and class selects project to build.

3. Class Vice-President distributes organizational chart for Group Project and may have students apply for positions.

4. Students report during seminar on role or duties they hold in Group Service Project. Research and Design Directors work to determine specifications and prepare drawings.

5. Students apply for jobs in the organization.

6, 7 & 8. Teacher may demonstrate technical areas related to project selected as needed in construction.

9. Students use laboratory to build sub-parts of project.

10. Reporting seminar permits students to present work completed or problems solved.

11. Students use laboratory to assemble or complete project.

12. Reporter and Historian write stories for publi information.

13. Teacher evaluates each stude participation as to technical knowledge gained and interest in helping others.

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DUTIES FOR IN-CLASS ENTERPRISING PRODUCTS

This activity will use the procedures of the "Line Production" method which begins on page 49 of the **Exploring Technology Guide**. The method is used "to acquaint students with: the ways in which contemporary industry organizes people, materials, and machines into a common endeavor; the study of occupations related to areas of management and labor within industry . . ." The student learns to develop a company, solve management problems and realize profits from a salable product or service.

Officer and Committee Duties

Enterprising Committee:	This committee of the class meets separately to design or select products or services to enterprise for a profit. May use criteria for product selection, sketches or mockups. Organize sales training for all class members such as: Making sales presentations, taking orders and keeping records of sales contacts made, good manners and courteous behavior.
President:	Calls meeting to hear report of Enterprising Committee and involve class as Board of Directors in deciding what product to make and how profit will be used after product is sold.
Vice-President:	Reproduces an organizational chart of a company and sample personnel roles for distribution to students.
Secretary:	Records information decided by Board of Directors and result of voting for General Manager in the company.
Treasurer:	Helps determine financial needs of class and determine capital needed to begin production. Suggests recordkeeping system for enterprise.
Parliamentarian:	Prepares mock incorporation papers for the company and obtains approval from school officials with teacher.
Sgt. at Arms:	Assigns cleanup duties appropriate to production activity of class.
Historian:	Files records and samples of every phase of activity for other classes to use.
Reporter:	Selects or makes promotion materials to advertise product or service to school.

TYPICAL ENTERPRISING PRODUCT SCHEDULE

Class Meeting 1. Teacher explains line production method that class will use to raise funds for activity they select.

2. Enterprising Committee reports to class showing sketches or mockup models of products which could be produced and sold. Class votes on product and activity as the Board of Directors.
3. Vice-President distributes organizational chart for company. Class votes for person to lead as General Manager.
4. General Manager selects second line management and the Personnel Director to hire all other employees.
5. Design Engineer presents drawings to class and will prepare a very accurate prototype with the help of the production and industrial engineering departments.
6. Assess school for product sales appeal
7. Each person will report on completed duties accomplished in the role held.
8. Personnel Manager will assign students to make necessary jigs and fixtures.
9. Assign students to work stations and try out a test run.
10. Production of products on assembly line.
11. Advertising personnel will design and produce posters and order forms for product sales.
12. Prepare a marketing management system to control products. Record who is contacted and sales information.
13. Deliver product to customer.
14. Account for all purchases, sales and losses.

DUTIES FOR IN-CLASS CONTESTS OR RECOGNITION

This activity will involve students in contests which are provided at local, regional, state and national conferences. Thus, students may practice and compete in tool identification, prepare an exhibit or give a speech as part of the way they are learning Industrial Arts. The teacher should suggest these contests to the Recognition Committee that relate to the course the students are taking.

Officer and Committee Duties

Recognition Committee:	This committee of the class meets to determine what contests relate to class and study rules for possible contests to be held in class or laboratory.
President:	Opens class meeting to hear report of Recognition Committee and involve students in selecting contest for class to use.
Vice-President:	Assists with organizational chart to show how students will compete.
Secretary:	Writes letters to persons who will be asked to serve as judges.
Treasurer:	Assists in determining and purchasing awards to be given to winners.
Parliamentarian:	May help select judges for contests and review rules for participation.
Sgt. at Arms:	May assist judges in keeping order or use of rules.
Reporter:	Writes up news stories about contests, exhibit or demonstration and announces winners. May invite community or other students to see contests.
Historian:	Keeps records of each activity and files records or photos for future reference.

DUTIES FOR IN CLASS OPEN HOUSE EXHIBITS

This activity will involve students in gaining recognition for their achievements in the industrial arts course. The officers of the class will assist with the activity and every student will not only help but will also contribute projects to be exhibited.

OFFICER AND COMMITTEE Duties

Recognition Committee:	This committee of the class meets to determine what type of Open House will be appropriate to the course and works with teacher to arrive at the best date.
President:	Opens class meeting to hear report of the Recognition Committee and involve class members in the decisions related to the Open House.
Vice-President:	Assists with the organizational procedures and work assignments of committee members and officers.
Secretary:	Writes letters or helps with invitations send to school personnel and others class wants to invite.
Treasurer:	Records expenses incurred during the Open House activity and seeks funds to meet these costs.
Parliamentarian:	Makes sure that proper procedures are followed as visitors are invited or other arrangements are made within the class or school.
Sgt. at Arms:	May assist committee in setting up exhibit tables and arranging for or cleaning up after open house.
Reporter:	Helps to publicize the Open House around the school. Takes photos and writes story before and after the event for the newspaper.
Historian:	Files and keeps information or photos of the event for use by future students.

SCHEDULES FOR RECOGNITION EVENTS

USING A CONTEST IN CLASS

1. Teacher presents rules and purpose of contest during class time.
2. Recognition Committee suggests possible contests for class to use.
3. Officers lead class meeting to decide of contest to be used.
4. Committee reviews or plans rules and organizes time schedule for individuals to compete.
5. Students practice during class or as homework.
6. Students or other judges select up to six finalists.
7. Finalists compete before judges and awards are presented to each.
8. Reporter and other officers carry out their duties.

ENTERING A CONTEST

1. Obtain and study contest guidelines or rule books.
2. Complete forms to pre-register in contest.
3. Mail forms to Spring Festival Contest Chairperson.
4. Prepare and practice for event in class, school and as homework.
5. Demonstrate to class and other school groups for judging or criticism.
6. Dress and conduct oneself appropriately for judging.
7. Appear at scheduled time for contest and awards program.

HOLDING AN OPEN HOUSE

1. Class decides if open house will be by class alone or request school AIASA to cooperate.
2. Obtain permission from school office date and place of open house.
3. Organize class members to help with various set-up details.
4. Announce to students how to enter projects for open house exhibit.
5. Send invitations to school personnel, parents and community members.
6. Provide recognition for those who participate.

GIVING A TECHNICAL DEMONSTRATION

1. Select a technical topic which would interest or help other people.
2. Prepare research report or speech on the topic of demonstration.
3. Make models or assemble tools for demonstration.
4. Practice giving demonstration in class, school or as homework.
5. Arrange time and place to give demonstration such as State Fair, shopping mall or open house.
6. Dress and conduct oneself in professional way prior to and during demonstration.
7. Provide demonstration and answer questions of those who watches.

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REGIONAL, STATE, AND NATIONAL RECOGNITION EVENTS FOR INDUSTRIAL ARTS STUDENTS

TECHNICAL PERFORMANCE CONTESTS
- Architectural Drawing
- Engineering Drawing
- Electricity/Electronics
- Graphic Arts
- L.S.R.A.V. (model race cars)
- Leathercraft
- Photography
- Metal Machining
- Small Engine Trouble Shooting
- Tool and Machine Identification
- Woodturning - between centers
- Woodturning - face plate
- Screen Process Printing (hand cut film)
- Metric 500 Race

GENERAL CONTESTS
- General Knowledge Test
- Public Speaking Contests (prepared and extemporaneous)
- Chapter Team Contest
- Research Paper Entry Contest
- Safety Poster Entry Contest
- Technical Writing Contest

Booth or Display Contests
- Co-Curricular Activity Exhibit
- Community Service Project Exhibit
- Scrapbook or Record Book Exhibit
- Fund Raising Project Exhibit
- Booth Exhibit

PROJECT EXHIBIT CONTESTS (enter by course title and course code)
- Exploring Technology
- Modern Industry
- Construction
- Manufacturing
- Communications Technology
- Materials and Processes Technology
- Power and Transportation Technology
- Architectural Drawing
- Basic Technical Drawing
- Electricity and Electronics
- Energy and Power
- Engineering Drawing
- Graphic Communications
- Metals Technology
- Woods Technology
- General Industrial Arts
- Industrial Crafts
- (for other titles see Spring Festival Permanent Rules)

CHECKLIST FOR CONTEST PARTICIPANTS

Directions: Performance and leadership contests are judged on the following aspects. To assist students to improve themselves for the contest these statements can be checked off by another person.

Technical Understanding

_______1. Accurate information used from books and research.
_______2. Impact or value of technology understood.
_______3. Safety procedures are used or described.
_______4. Information reviewed or approved by teacher.

Leadership

_______1. Leadership ability is exhibited.
_______2. Experienced as officer or participant in AIASA.
_______3. Voice and mannerisms are appropriate.
_______4. Assists with projects of class.
_______5. Helped arrange materials and forms for entry into contest.
_______6. Sent registration materials to contest chairperson.

Career Information

_______1. Knows at least 5 careers related to contest.
_______2. Understands requisites for career entry.
_______3. Lists programs for occupational preparation.

Performance

_______1. Shows interest and enthusiasm.
_______2. Dressed appropriate to contest.
_______3. Presents or demonstrates information in orderly manner.
_______4. Develops eye contact.
_______5. Voice and manner professional.
_______6. Paper organized well and holds interest.
_______7. Writing is accurate and to the point.

BEST COPY AVAILABLE

4

Production Management

OBJECTIVES

After the students have covered the material in this unit, they should be able to—

1. define management;
2. demonstrate and apply the functions of management;
3. understand the relationship of organizational structure; and
4. understand the interrelationships among managed areas of production.

KEY WORDS: VOCABULARY

The words in the following list may be new to the students studying manufacturing. Teachers should help students understand these words as they are used in this topic of study.

management
planning
organizing
controlling
directing
motivating
stockholders
board of directors
line and staff
research and development
production
industrial relations
marketing
financial affairs
prototype
jigs and fixtures
quality control

TEACHING AIDS

- Overhead projector
- Appendices A and B
- Test Key: 1-C, 2-B, 3-D, 4-B, 5-D, 6-C, 7-A, 8-D, 9-B, 10-C
- Transparencies: You will find Transparencies M4-1 through M4-7 at the end of this unit. If you wish, these masters may be duplicated in quantity and given as handouts to the students while they are studying the different aspects of this unit.

M4-1: Functions of Management
M4-2A: Organizational Structure
M4-2B: Organizational System/Industrial Corporation
M4-3: Research and Development
M4-4: Industrial Relations
M4-5: Production
M4-6: Marketing
M4-7: Finance

SUGGESTED REFERENCES

Bame, E.A., and Cummings, P. Exploring Technology. Worchester, Mass.: Davis Publications, 1980.

Fales, James; Sheets, Everett; Mervich, Gregg; and Dinan, John. Manufacturing: A Basic Text for Industrial Arts. Bloomington, Ill.: McKnight Publishing Company, 1980.

Groneman, Chris H., and Grannis, Gary E. Exploring the Industries. Albany, N.Y.: Delmar Publishers, 1981.

Jambro, Donald J. Introduction to Manufacturing. Albany, N.Y.: Delmar Publishers, 1982.

Lux, Donald G., and Ray, Willis E. World of Manufacturing. Bloomington, Ill.: McKnight Publishing Company, 1971.

SENTENCE OUTLINE

I. What is management?
   A. Management is getting positive work done through other people.
   B. Management involves planning, organizing, controlling, directing, motivating, and monitoring workers and production activities.
   C. Management involves taking an idea of what the consumer wants, researching and developing it, producing it, and marketing it for a profit.
   D. Management also involves the activities of industrial relations and financial affairs.

II. Functions of management (Transparency M4-1)
   A. Planning is setting up long-range and short-range goals to establish plans and develop procedures and policies to carry out the overall responsibilities of the company.
   B. Organizing involves determining what staff is needed to carry out the plans of the company.
   C. Controlling is measuring and evaluating performance by company results against accepted goals.
   D. Directing involves assigning workers with specific jobs and responsibilities.
   E. Motivating is providing the proper encouragement and working environment to cause workers to perform at their full potential.
   F. Monitoring is checking the worker's performance.

III. Relationship of the organizational structure (Transparency M4-2A)
   A. All companies have a hierarchical structure with various levels of line and staff duties and responsibilities. (Transparency M4-2B)
   B. Manufacturing companies are owned by **stockholders** who have the final say over the company's activities.
   C. The board of directors is the elected representative of the stockholders who are responsible for determining the company policies, declaring dividends, and entering into contracts on behalf of the company.
   D. The company's policies are carried out by the company's chief executive officer (CEO).
   E. The executive staff is composed of a series of vice-presidents in charge of the various functional areas of the company: production, finance, research and development, marketing, and industrial relations.
   F. Each vice-president is responsible for various line and staff functions which include managing the employees and operations of those reporting to the particular vice-president.
   G. Supervisors oversee the line assemblies for fabrication and production. They report to a plant superintendent or directly to the vice-president in charge of that specific activity.

IV. Managed areas of production
   A. Research and development (Transparency M4-3)
      1. Research and development is in charge of researching and developing new and/or improved products and processing ideas.
      2. Research and development is also responsible for product engineering or developing **prototypes.**

3. Jigs and fixtures used to produce the new products are also designed and developed in the research and development stages.
4. The specific processing procedure is planned, organized, and developed by research and development.

B. Industrial relations (Transparency M4-4)
   1. Industrial relations is responsible for hiring, training, advancing, retraining, demoting, and retiring workers.
   2. They also handle the public relations for the company.
   3. They maintain accurate and up-to-date records on the employees.
   4. Usually, the industrial relations department administers the safety program from the company.
   5. This department is usually responsible for negotiating union contracts on behalf of the company, as well as handling grievance procedures.

C. Production (Transparency M4-5)
   1. Production is usually divided into two major areas:
      a. **fabrication**—which produces the parts for the product
      b. **production**—which assembles the parts into a product
   2. Line supervisors are in charge of the various fabrication and production departments of the company.
   3. This area is also responsible for assigning workers to specific jobs or tasks to fabricate or produce the product.
   4. Production is responsible for quality control.

D. Marketing (Transparency M4-6)
   1. Marketing is responsible for—
      a. identifying the product market;
      b. advertising the product;
      c. selling the product; and
      d. distributing the product.
   2. Marketing personnel track, analyze, and chart how well a certain product is selling, customer complaints, and other factors that influence the success of that product.

E. Finance (Transparency M4-7)
   1. Finance is responsible for the accountability of—
      a. the company's money;
      b. financial record keeping; and
      c. purchases necessary to operate the company.
   2. Finance also works with inventory control.
   3. Budgeting is also a major responsibility of finance.

MATERIALS FOR STUDENTS

- Vocabulary worksheet
- Appendices A and B

SUGGESTED STUDENT ACTIVITIES

1. Have students design product ideas that could be mass-produced by the class, refine their ideas, and build prototypes. This activity can also be done as a group activity and may relate directly to an AIASA enterprising or service project.
2. Have students perform various marketing functions: identify product markets, design and develop advertising for the products, and sell and distribute mass-produced products. This activity can also be related directly to an AIASA enterprising or service project.

3. Have students mass-produce a product, which includes fabricating parts, making subassemblies, and producing the product. This activity can also be related directly to an AIASA enterprising or service project.
4. Have students perform industrial relations functions as a part of the mass production activity.

Vocabulary Worksheet

1. management
2. planning
3. organizing
4. controlling
5. directing
6. motivating
7. stockholders
8. board of directors
9. line and staff
10. research and development
11. production
12. industrial relations
13. marketing
14. financial affairs
15. prototype
16. jigs and fixtures
17. quality control

TEST

Unit 4: Production Management

Directions: Read each statement carefully. Select the word or phrase that correctly answers or completes the statement, and write the appropriate letter in the blank.

Example: __B__ 21. The class that you are in is—

A. Health
B. Industrial Arts
C. Math
D. Science

___ 1. Setting up long-range and short-range goals to establish plans and develop procedures and policies to carry out the overall responsibilities of the company is—

A. organizing
B. controlling
C. planning
D. directing

___ 2. Measuring and evaluating performance by comparing results against accepted goals is—

A. organizing
B. controlling
C. planning
D. directing

___ 3. Assigning workers with specific jobs and responsibilities is part of—

A. organizing
B. controlling
C. planning
D. directing

___ 4. Determining what staff is needed to carry out the plans of the company is involved in—

A. organizing
B. controlling
C. planning
D. directing

___ 5. Checking the work performance is—

A. controlling
B. directing
C. motivating
D. monitoring

___ 6. Providing the proper encouragement and working environment to cause workers to perform at their full potential is—

A. controlling
B. directing
C. motivating
D. monitoring

___ 7. Developing new and/or improved products and processing ideas are involved in—

A. research and development
B. industrial relations
C. marketing
D. production

___ 8. Engineering, fabricating, and producing the industrial product are areas of—

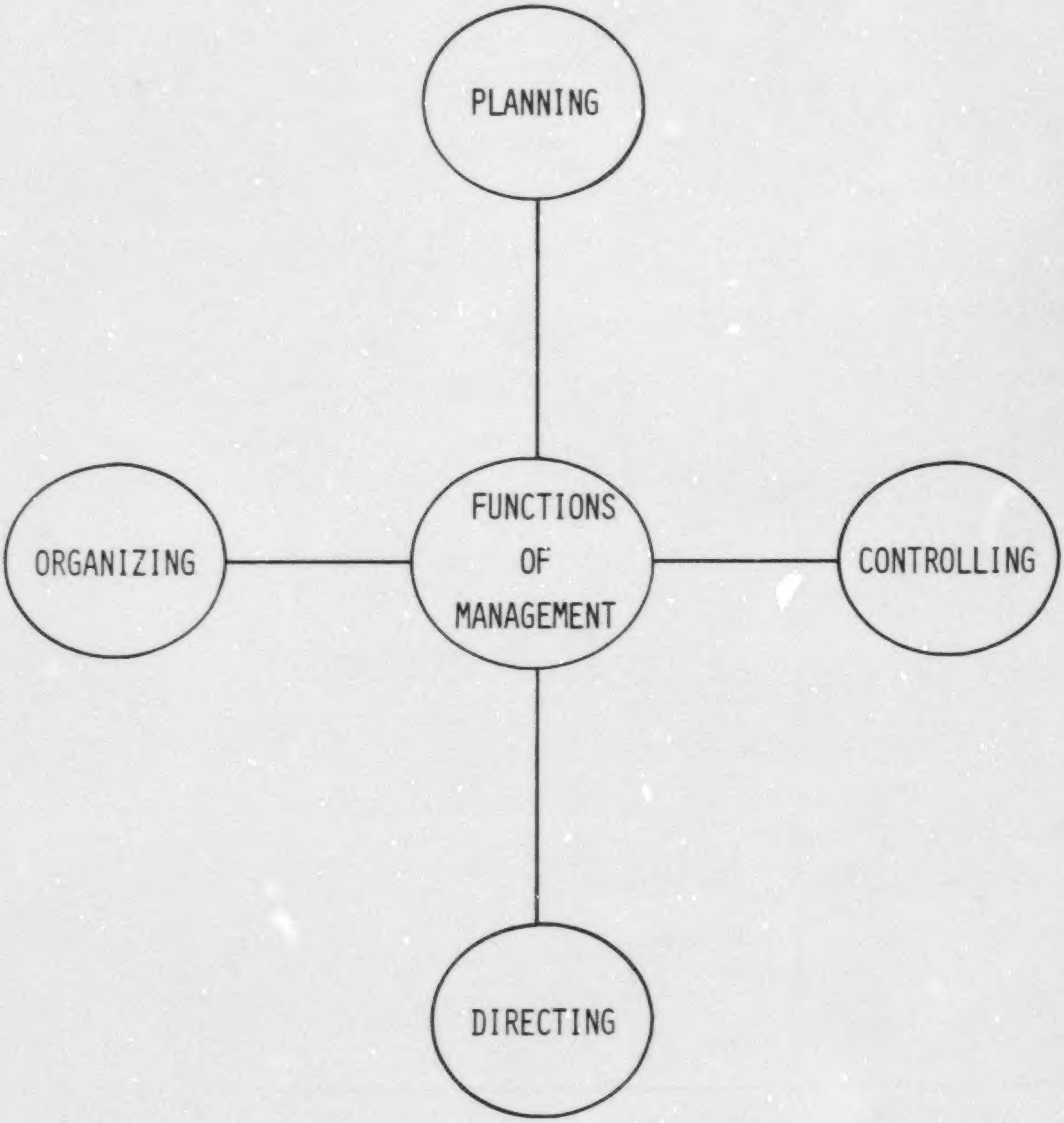
A. research and development
B. industrial relations
C. marketing
D. production

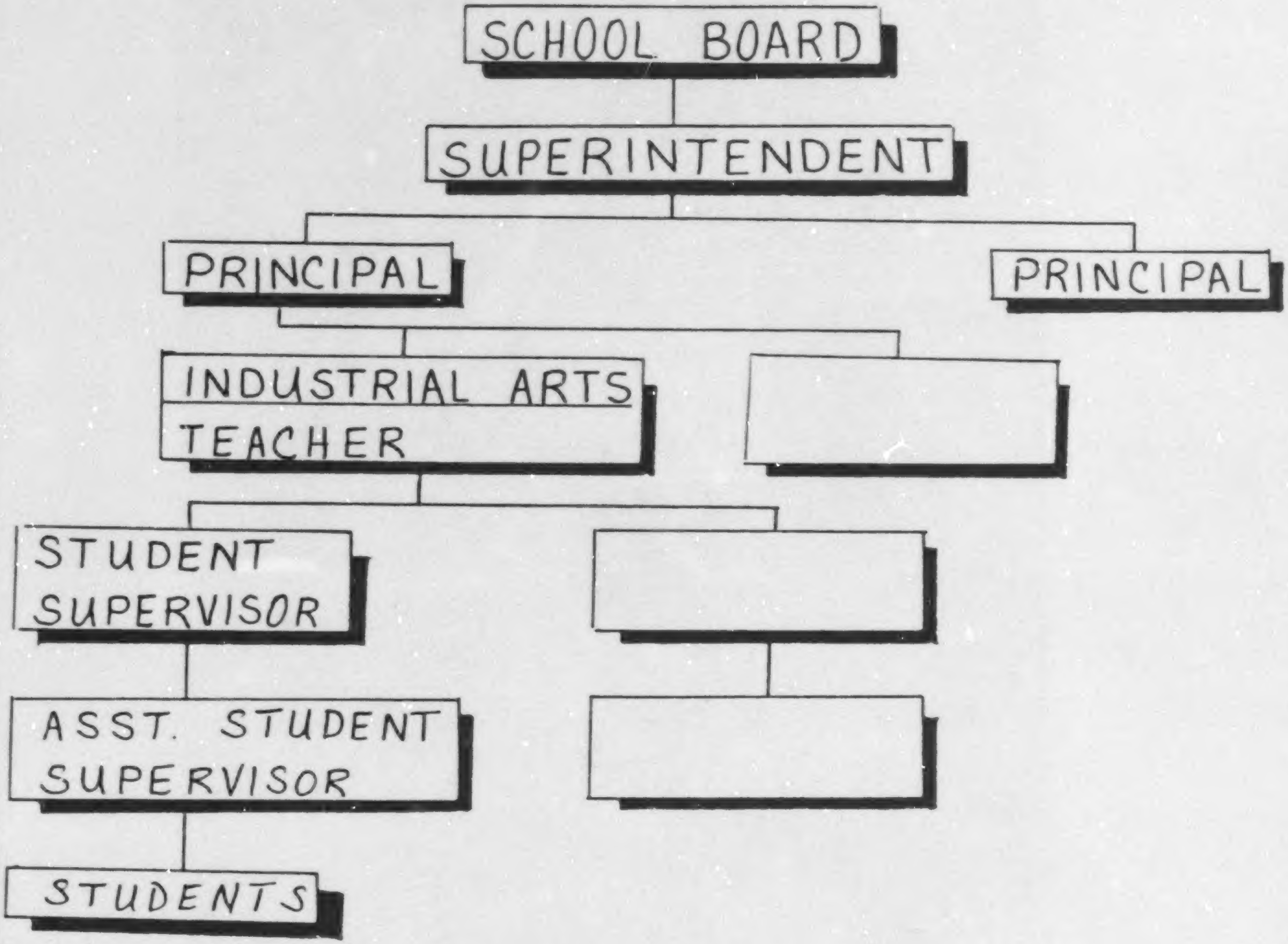
___ 9. The department responsible for hiring, training, advancing, retraining, demoting, and retiring workers is—

A. research and development
B. industrial relations
C. marketing
D. production

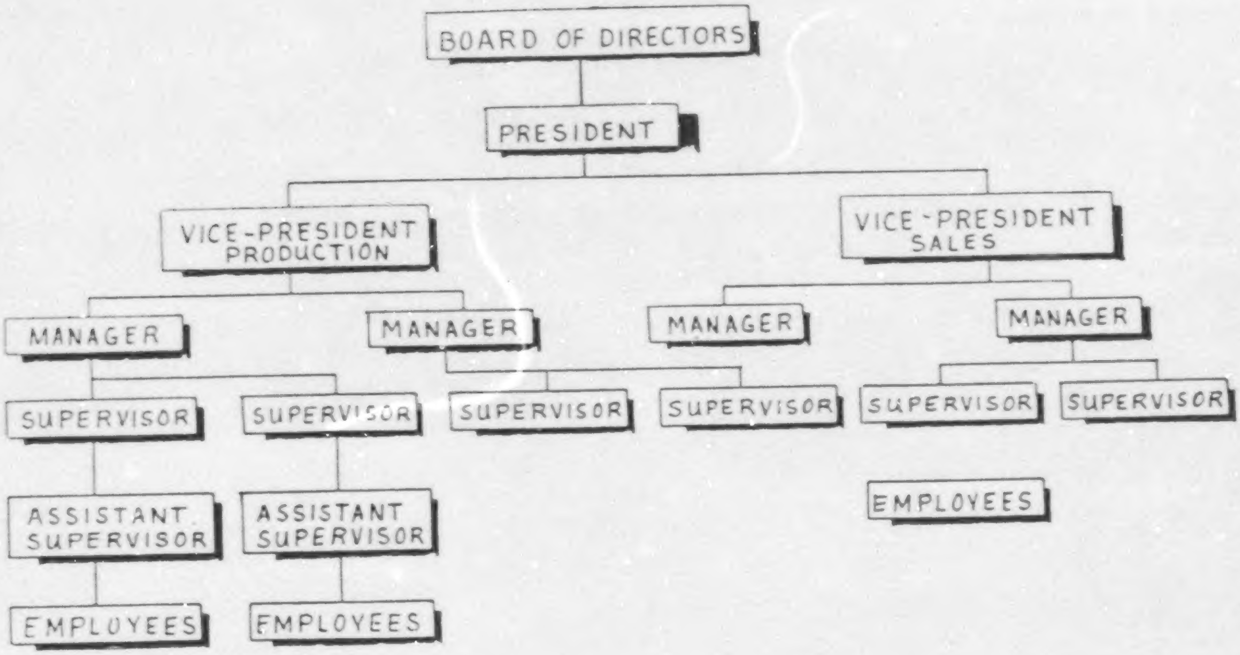
___ 10. The production area that is responsible for identifying the market of a product, and for advertising, selling, and distributing the product is—

A. research and development
B. industrial relations
C. marketing
D. production


PLANNING
ORGANIZING
FUNCTIONS OF MANAGEMENT
CONTROLLING
DIRECTING


SCHOOL BOARD
SUPERINTENDENT
PRINCIPAL
PRINCIPAL
INDUSTRIAL ARTS TEACHER
STUDENT SUPERVISOR
ASST. STUDENT SUPERVISOR
STUDENTS

ORGANIZATIONAL STRUCTURE


BOARD OF DIRECTORS
PRESIDENT
VICE-PRESIDENT PRODUCTION
VICE-PRESIDENT SALES
MANAGER
MANAGER
MANAGER
MANAGER
SUPERVISOR
SUPERVISOR
SUPERVISOR
SUPERVISOR
SUPERVISOR
SUPERVISOR
ASSISTANT SUPERVISOR
ASSISTANT SUPERVISOR
EMPLOYEES
EMPLOYEES
EMPLOYEES

ORGANIZATIONAL SYSTEM
INDUSTRIAL CORPORATION

RESEARCH AND DEVELOPMENT

IDENTIFYING THE PROBLEM

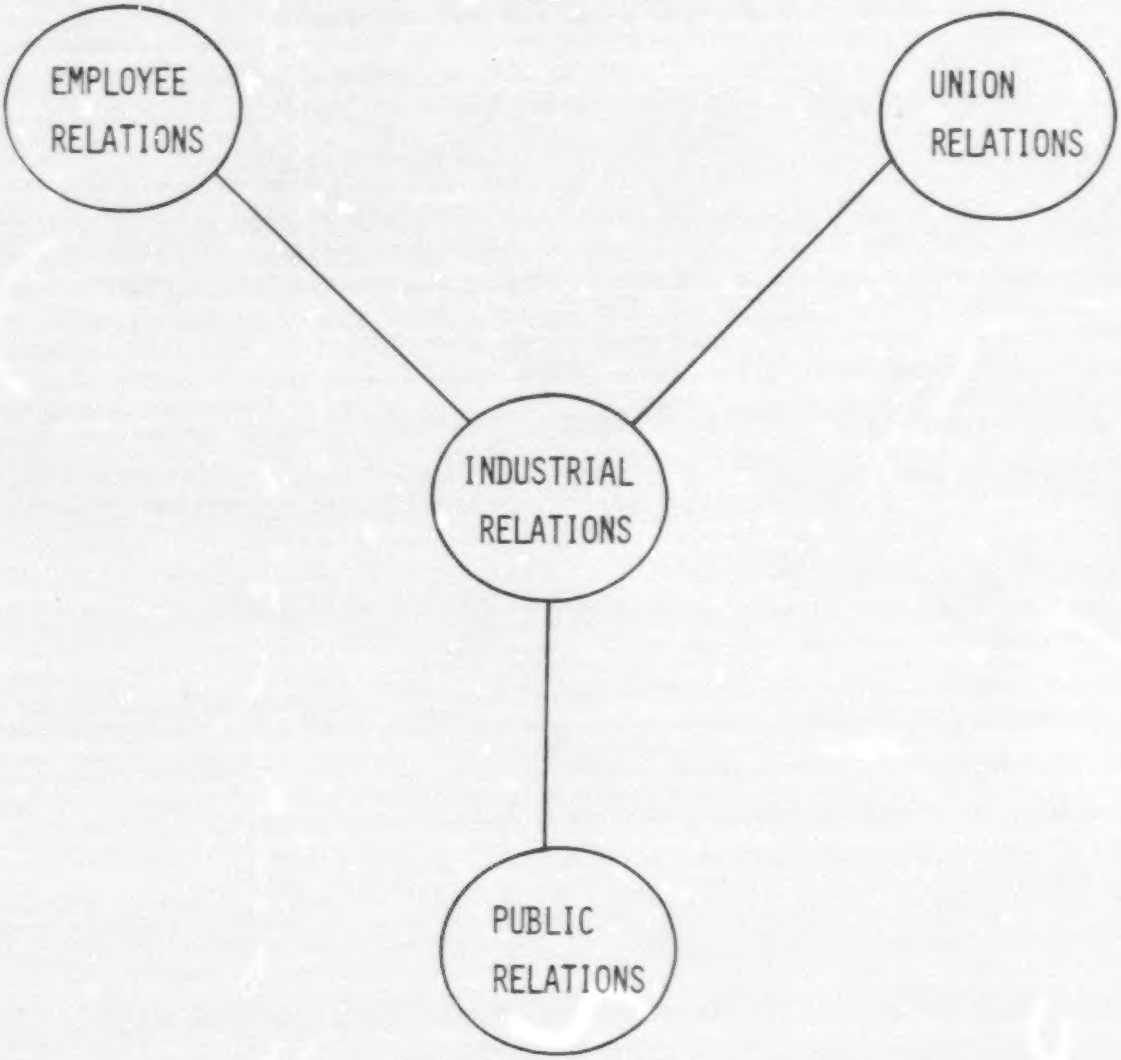
GATHERING INFORMATION

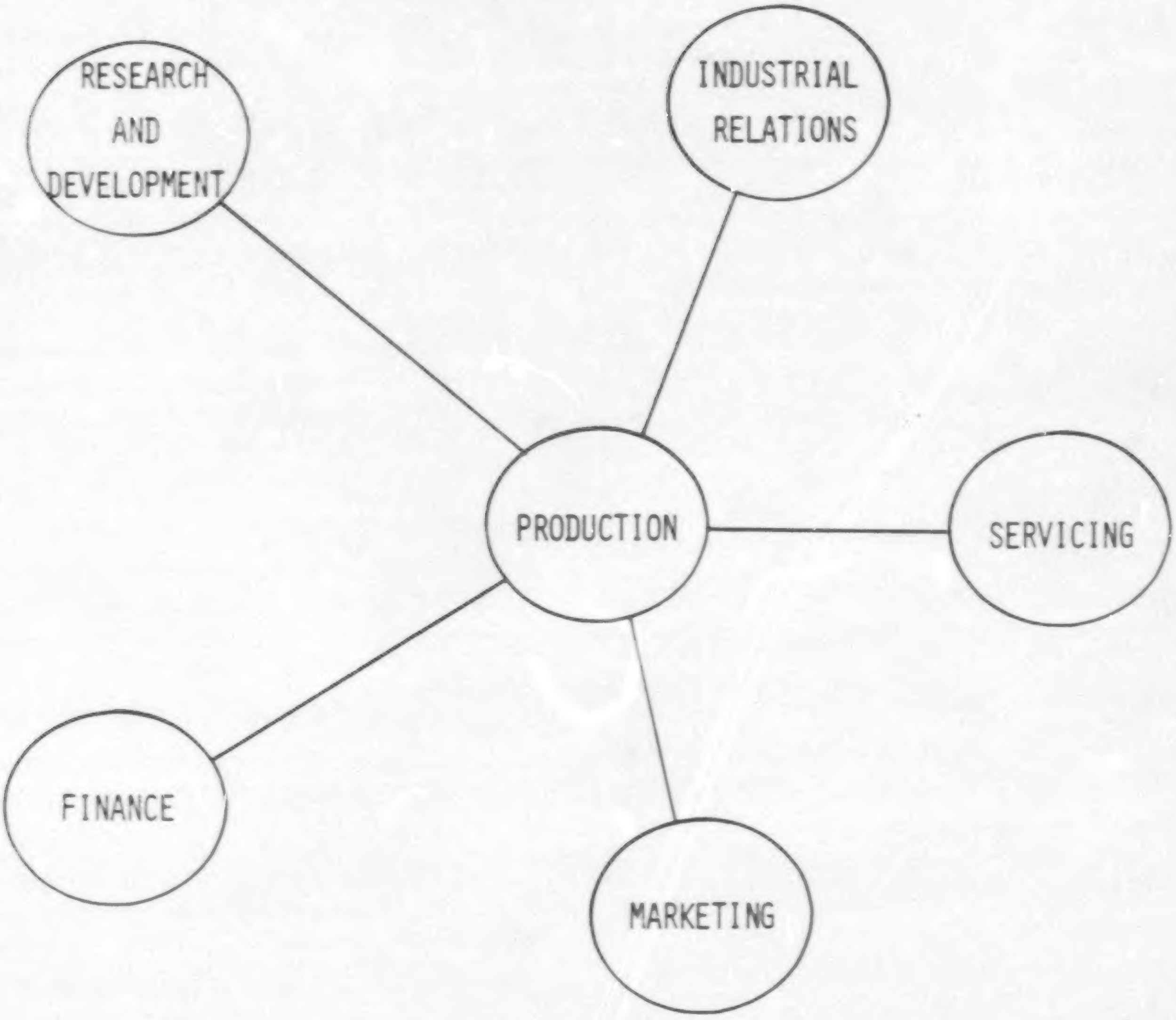
DESIGNING

SELECTING THE PRODUCT

SPECIFYING THE PRODUCT

PRODUCTION


EMPLOYEE RELATIONS
UNION RELATIONS
INDUSTRIAL RELATIONS
PUBLIC RELATIONS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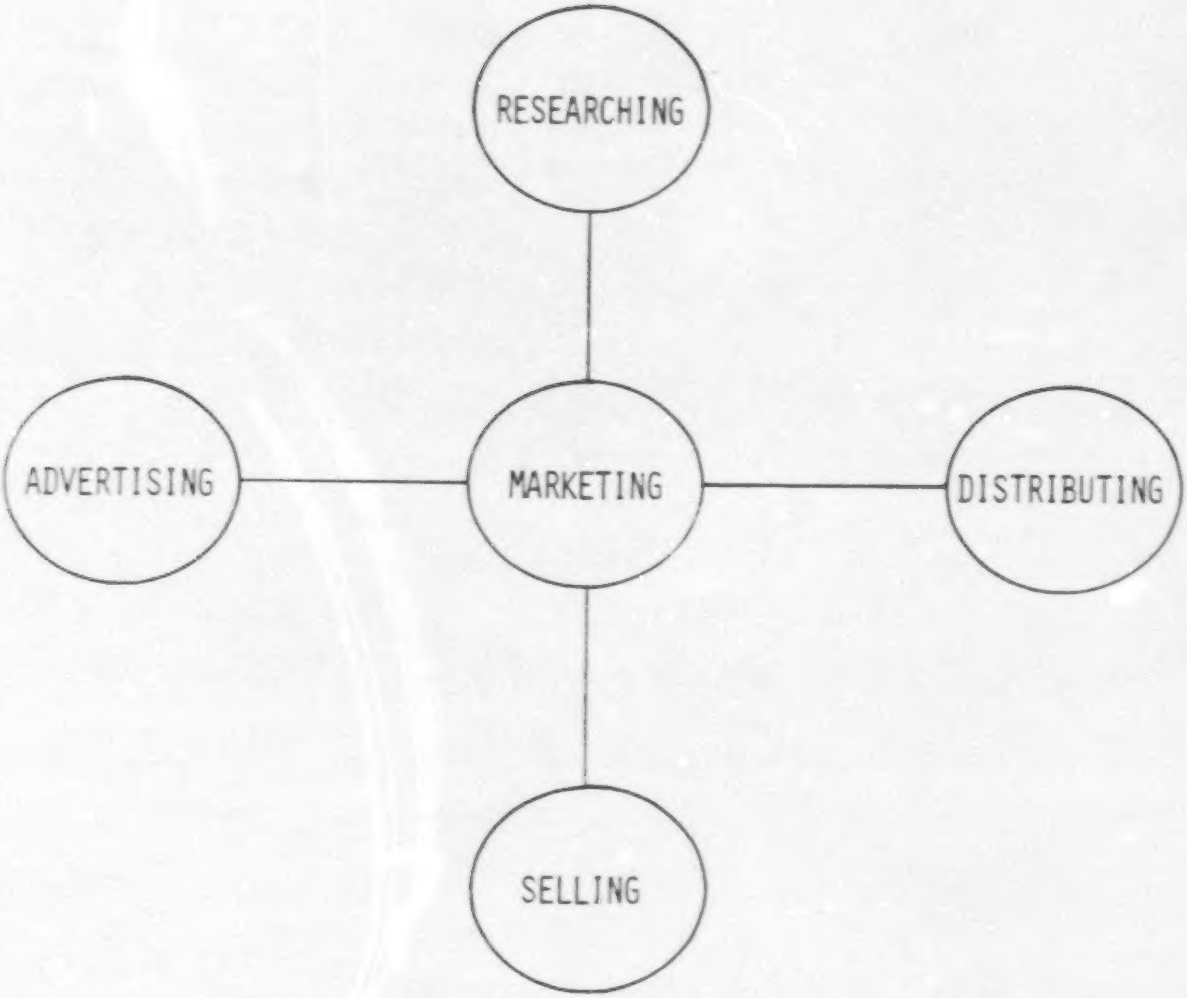
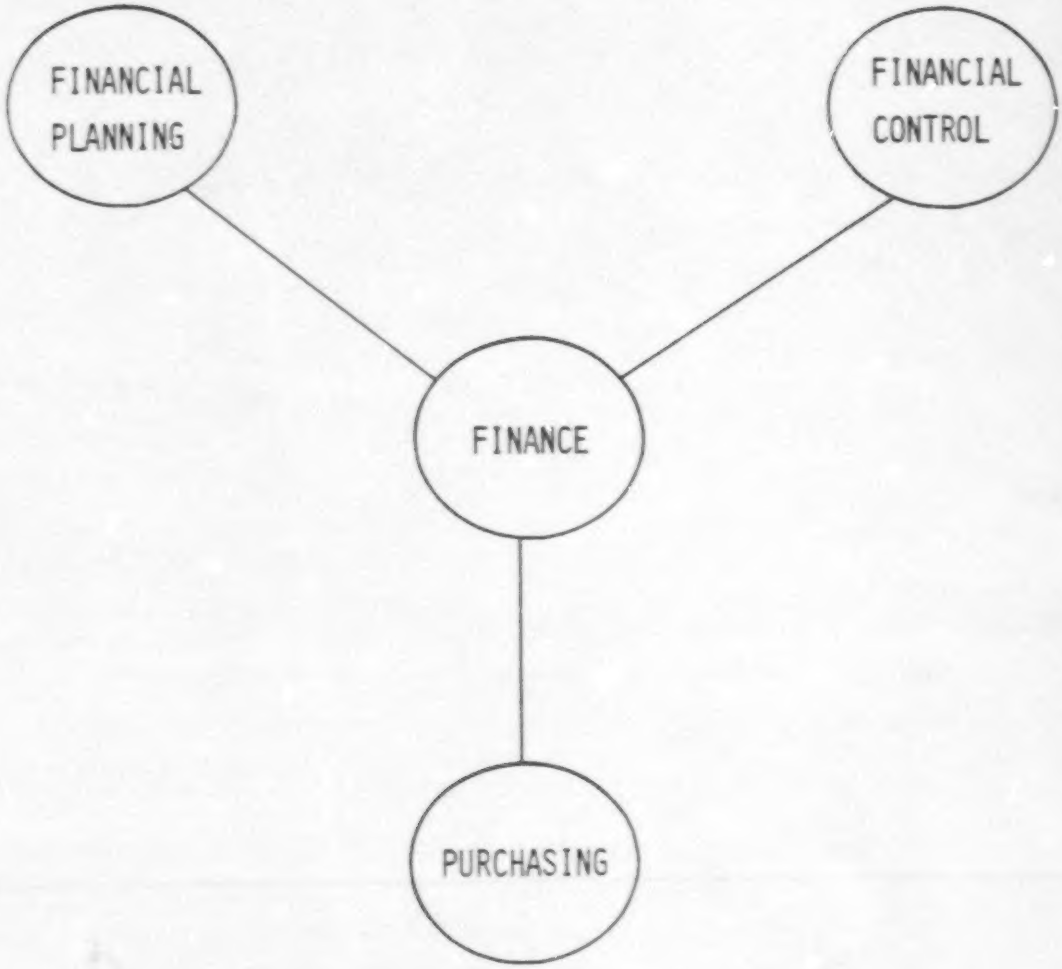
INDUSTRIAL RELATIONS
PRODUCTION
SERVICING
FINANCE
MARKETING


RESEARCHING
ADVERTISING
MARKETING
DISTRIBUTING
SELLING


FINANCIAL PLANNING
FINANCIAL CONTROL
FINANCE
PURCHASING

5

Entrepreneurship

OBJECTIVES

After the students have covered the material in this unit, they should be able to—

1. describe the fundamental differences between the three major economic systems of communism, socialism, and capitalism;
2. list several ways that individuals and companies can invest capital to make more money;
3. describe the free enterprise system as it relates to the industrial system in the United States;
4. describe an entrepreneur;
5. describe the guidelines for entrepreneurship; and
6. list three controls that regulate the free enterprise system.

KEY WORDS: VOCABULARY

The words in the following list may be new to the student studying manufacturing. Teachers should help students understand these words as they are used in this topic of study.

economy
communism
socialism
capitalism
capital
entrepreneurship
regulation
partnership
corporation
investment
profit
stocks
competition
free enterprise system
supply and demand
sole proprietorship
business plan
financial plan

TEACHING AID

Test Key: 1-C, 2-A, 3-B, 4-B, 5-D, 6-B, 7-A, 8-C, 9-C, 10-D

SUGGESTED REFERENCES

Fales, J.; Sheets, E.; Mervich, G.; and Dinan, J. Manufacturing: A Basic Text for Industrial Arts. Bloomington, Ill.: McKnight Publishing Company, 1980.

Wright, T. R. and Jensen, J. R. Manufacturing Materials Processing, Management, Careers. South Holland, Ill.: Goodheart-Willcox Company, 1976.

SENTENCE OUTLINE

I. Introduction
  A. Three types of ownership
    1. **Sole proprietorship** refers to a single person owning a business.
    2. **Partnership** refers to several people owning a business together.
    3. A **corporation** exists when shares of stock are sold to individuals and these individuals act as one to operate the business.

B. All companies are organized in a certain hierarchical structure, with various line and staff functions and responsibilities.
C. Entrepreneurship involves the functions of planning, organizing, controlling, and directing workers and activities.
D. It involves the feasibility of providing a product or service of high quality to the consumer at a fair price.
E. Securing and training manufacturing workers for the business is a vital part of entrepreneurship.
F. Scheduling workers and routing materials for the job is a major responsibility to the overall success of the business. Seeing that the job is completed on time with good workmanship is another.

II. What is communism? (examples: Russia and China)
   A. This type of government is highly centralized with a small group of governmental leaders making major economic decisions for everyone.
   B. The government owns the means to production (such as land, raw materials, factories, stores, and transportation).
   C. Communism and socialism are basically the same, except politically. Communism may favor revolution and force to spread its beliefs, whereas socialism advocates peaceful political change.
   D. Entrepreneurships cannot exist in a highly centralized form of government where risk-taking is discouraged.

III. What is socialism? (examples: Sweden and Denmark)
   A. Socialism is similar to communism in that the means of production are owned by the government, and a small group of leaders determine what, when, and how much to produce.
   B. Advocates of socialism believe in peacefully blending their beliefs into society.
   C. Most socialist states are mixed, allowing the coexistence of capitalism.
   D. Entrepreneurship can flourish in a mixed socialist and capitalist state, but cannot exist in a pure socialist country.

IV. What is capitalism? (examples: United States and Canada)
   A. **Capitalism** is an economic system that stresses private economic decision making. It operates without the overall economic grand plan common to communism and socialist economic systems.
   B. Capitalism is based on **capital**, or the surplus money of a company or individual.
   C. Capital is **invested** by individuals or companies with the hope of making more money.
      1. An individual may invest capital in a bank that pays **interest**, or take more of a risk and invest it in **stocks** which provide capital to companies.
      2. A company may invest its capital in new machines and facilities to produce more, better, or new products in hopes of making a **profit** or more money from its capital.

V. The free enterprise system and entrepreneurs
   A. The industrial system in the United States is known as a free enterprise system, and the individuals and companies are free to make nearly any product they wish.
   B. The free enterprise system encourages individuals and companies to become entrepreneurs.
   C. Entrepreneurs are risk takers who invest capital to produce products with the hope of making a profit.
   D. The free enterprise system is controlled by the laws of **supply and demand, competition**, and **regulation.**
      1. **Supply and demand.** When demand is high for a product, entrepreneurs are willing to invest capital to produce more of a product, but a high supply of a product discourages entrepreneurs from investing capital.

2. **Competition.** This is also a characteristic of a free enterprise system. Competition allows for two or more companies to produce similar products and to compete in the marketplace for the consumer's dollar. The company that produces the best product, at the lowest price, usually makes the most profit.
3. **Regulations.** These are set by the government and private agencies to control the type and specifications of a certain product. (Example: The Environmental Protection Agency (EPA) requires car makers to control the pollutants they emit into the environment, or the Federal Drug Administration (FDA) requires that new medicines placed on the market are safe.)

VI. Becoming an entrepreneur

A. An enterprise is any business that sells either products or services, or both, and is owned, managed, and controlled by one or more persons.
B. All enterprises carry with it basic risks. There are no guarantees of success, of making a profit, or that you will avoid losing your investment.
C. Private enterprise in America is a privilege of our economic system.
D. Our entire business system is made up mostly of small, privately owned companies.
E. Our marketing system and competition within the markets for products and services is the strength of America.
F. Our system is efficient because competition forces individual owners to streamline, cut waste, improve products and their services, and place the consumer or customer at the top of the economic pile.
G. Entrepreneurship lets you decide your own destiny.
H. The entrepreneur's keys to success are how well you manage what you have and how well you plan.
I. Entrepreneurship provides challenge and personal satisfaction.
J. Satisfaction is knowing that you provide a valuable service to customers and make their lives better.

VII. Dangers and pitfalls to avoid

A. Owning and managing a business requires great personal sacrifice.
B. Ownership requires serious responsibilities.

VIII. Guidelines for entrepreneurship

A. Get the right kind of assistance.
  1. Seek literature, publications, periodicals, textbooks, and other resources that give advice and essential knowledge.
  2. Visit the Small Business Administration offices.
  3. Talk to a local banker.
  4. Practical experience can be gained by working in the kind of business you wish to operate.
B. Prepare a plan.
  1. You need a business plan.
  2. You need a marketing plan.
  3. You need an operating (profit and loss) plan.
  4. You need an organization and staff plan.
  5. You need job descriptions and responsibilities assigned to functions.
C. Get the financial assistance you need before you start.
  1. You need a good credit rating.
  2. You must know what you want to do.
  3. You must have a good plan.
  4. You must demonstrate good management and financial responsibilities.
  5. There should be a good balance between personal assets and borrowing funds.

D. Get professional marketing assistance.
   1. A competent commercial real estate agent can help you choose a good location, lease a building, buy an existing business, or perhaps develop a new business in a new location.
   2. You need an expert accountant to help you plan your finances, maintain your records, set up the right kinds of ledgers and accounts, interest rates, equipment purchases, employee records, tax reporting, and business planning.
   3. You need a competent attorney to help you plan the legal forms of ownership of your business, negotiate contracts and leases, get the right kinds of licenses and permits, and decide the types of liabilities you should assume.
   4. You need the help of the local chamber of commerce or merchants association.
   5. You need to join a professional trade association.

IX. Planning your business
   A. Financial planning
      The Bank of America suggests that an entrepreneur begin by asking four questions:
      1. What do I need the money for?
      2. How much money do I need?
      3. How and when can I repay the money borrowed?
      4. Can I afford to borrow money at this time?
   B. Business plan
      A good plan has seven parts:
      1. description
      2. market analysis
      3. product and service description
      4. sources of supply
      5. marketing plan
      6. management plan
      7. financial forms

MATERIALS FOR STUDENTS

- Vocabulary worksheet
- Newspapers, magazines
- Student handouts
- Notebook

SUGGESTED STUDENT ACTIVITIES

1. Select particular stocks from the newspaper and follow their activity for a month. Determine if a profit or loss has been made.
2. Research the three economic systems of communism, socialism, and capitalism.
3. Discuss the differences between communism, socialism, and capitalism.
4. Class officers will conduct a meeting to decide which product or service will be of economic value to the class or AIASA. The class will work as a group to form an enterprise. An enterprise committee will organize the technical and financial details for the class members. The entire class will work to make a profit for the class or to pay for AIASA dues or other activity (see Student Handouts No. 1-4).

5. Have students build a product of their choice. This product may fulfill a personal need, be for a family member, and be sold to someone in the community. Students should show a profit for their efforts. Compare this type of enterprise with that in Activity 4.
6. Have a real estate agent, an accountant, and a banker serve on a panel to discuss business and financial planning with the class. This should be done through an AIASA activity.

Vocabulary Worksheet

1. economy
2. communism
3. socialism
4. capitalism
5. capital
6. entrepreneurship
7. regulation
8. investment
9. profit
10. stocks
11. competition
12. free enterprise system
13. supply and demand
14. sole proprietorship
15. partnership
16. corporation
17. business plan
18. financial plan

TEST

Unit 5: Entrepreneurship

Directions: Read each statement carefully. Select the word or phrase that correctly answers or completes the statement, and write the appropriate letter in the blank.

Example: __D__ 21. The class that you are in is—

A. Science
B. English
C. Art
D. Industrial Arts

___ 1. What type of economy has an overall grand plan for what will be produced and who owns the means of production?

A. capitalism
B. socialism
C. communism
D. all of the above

___ 2. What economic system, due to its lack of government control, strongly encourages entrepreneurship?

A. capitalism
B. socialism
C. communism
D. all of the above

___ 3. Capital is—

A. money needed for basic survival needs of food, shelter, or clothing
B. surplus money an individual or company can use to invest
C. money put into a savings account
D. money invested in a company

___ 4. An entrepreneur—

A. can do well in a communistic country
B. is a risk taker
C. both of the above
D. does not need to make profits

___ 5. What controls determine what will be produced in a free enterprise system?

A. supply and demand
B. competition
C. government
D. all of the above

___ 6. What is stock?

A. money put into a savings account
B. money invested in a company
C. money needed for basic survival needs of food, shelter, or clothing
D. surplus money an individual can use to invest

___ 7. Sole proprietorship is—

A. a single person owning a business
B. several people owning a business together
C. the result of shares of stock being sold to individuals and these individuals act as one to operate the business
D. none of the above

___ 8. A partnership is—

A. a single person owning a business
B. the result of shares of stock being sold to individuals and these individuals act as one to operate the business
C. several people owning a business together
D. none of the above

___ 9. A corporation is—

A. a single person owning a business
B. several people owning a business together
C. the result of shares of stock being sold to individuals and these individuals act as one to operate the business
D. none of the above

___ 10. A business plan—

A. only includes a market analysis
B. only includes a product and service description
C. only includes a management plan
D. none of the above

STUDENT HANDOUT NO. 1

PURCHASE ORDER

PURCHASER ______________________________

ADDRESS ______________________ PHONE NO. ________

CITY ______________ STATE ________ ZIPCODE _____

JEWERY BOX NO. _____ COST $4.25 EA. TOTAL ______

DATE OF PURCHASE ______________________

SELLER FROM WHOM PURCHASED ______________

DATE TO BE DELIVERED ____________________

THE JEWERY BOX WHICH YOU ARE PURCHASING IS A PRODUCT OF THE WHITTIER HAWKS MANUFACTURING TECHNOLOGY CLASS AT WHITTIER MIDDLE SCHOOL. THE CLASS IS IN KEEPING WITH THE NEW TECHNOLOGY COURSE THAT WILL BE TAUGHT NEXT YEAR IN TEXAS AN POSSIBLY ACROSS THE UNITED STATES.

THANK YOU FOR YOUR PURCHASE.

THE COST IS TO COVER EXPENSES OF MATERIAL, ONLY.

WHITTIER HAWKS
1984
MANUFACTURING COMPANY

STUDENT HANDOUT NO. 2

INTERVIEW RATING FORM

SCORING: VERY GOOD = 15 GOOD = 10
FAIR = 5 POOR = 0

ITEM	SCORE	SCALE	
GROOMING	15	181-195 VERYGOOD	
CLOTHES	15		☐
POSTURE	10	131-180 GOOD	
MANNERS	15		
LANGUAGE	12		☑
FACE AND BODY CANTRAL	15	66-130 FAIR	
ATTITUDE	10		
PERSONALITY	10		
INTERVIEW SKILLS	10		☐
MOTIVATION	15	0-65 POOR	
PREPARATION	10		
QUALIFICATIONS	15		
POTENTIAL	15		☐
TOTAL	167		

NAME: Susanna Garcia

INTERVIEWER R Pyle

STUDENT HANDOUT NO. 1

PURCHASE ORDER

PURCHASER ____________________

ADDRESS ____________________ PHONE NO. __________

CITY __________ STATE __________ ZIPCODE ____

JEWERY BOX NO. ____ COST $4.25 EA. TOTAL ____

DATE OF PURCHASE ____________________

SELLER FROM WHOM PURCHASED ____________________

DATE TO BE DELIVERED ____________________

THE JEWERY BOX WHICH YOU ARE PURCHASING IS A PRODUCT OF THE WHITTIER HAWKS MANUFACTURING TECHNOLOGY CLASS AT WHITTIER MIDDLE SCHOOL. THE CLASS IS IN KEEPING WITH THE NEW TECHNOLOGY COURSE THAT WILL BE TAUGHT NEXT YEAR IN TEXAS AN POSSIBLY ACROSS THE UNITED STATES.

THANK YOU FOR YOUR PURCHASE.

THE COST IS TO COVER EXPENSES OF MATERIAL, ONLY.

WHITTIER HAWKS
1984
MANUFACTURING COMPANY

STUDENT HANDOUT NO. 2

INTERVIEW RATING FORM

SCORING: VERY GOOD = 15 GOOD = 10
FAIR = 5 POOR = 0

ITEM	SCORE	SCALE	
GROOMING	15	181-195 VERYGOOD	☐
CLOTHES	15		
POSTURE	10	131-180 GOOD	
MANNERS	15		
LANGUAGE	12		✓
FACE AND BODY CONTROL	15	66-130 FAIR	
ATTITUDE	10		
PERSONALITY	10		☐
INTERVIEW SKILLS	10		
MOTIVATION	15	0-65 POOR	
PREPARATION	10		
QUALIFICATIONS	15		☐
POTENTIAL	15		
TOTAL	167		

NAME: Susanna Garcia

INTERVIEWER R Pyle

STUDENT HANDOUT NO. 3

WHITTIER HAWKS MFG. CO.
2101 Edison Drive
San Antonio, Texas 78201
512-735-7181

APPLICATION FOR NON-CERTIFIED PERSONNEL

AIDES, FOOD SERVICE AND MAINTENANCE APPLICANTS

PERSONAL DATA

POSITION DESIRED: ____________________ SALARY DESIRED: __________

DATE AVAILABLE: __________ AVAILABLE FOR: ☐ FULL TIME ☐ PART TIME ☐ TEMPORARY
☐ 12 MOS. ☐ 10 MOS.

1. NAME: ______ Last ______ First ______ Middle ______ Other ______ Social Security No.

2. ADDRESS: ______ Number & Street ______ City ______ State ______ Zip Code

3. DATE OF BIRTH: ___/___/___ Month Day Year ☐ Citizen ☐ Non-Citizen

4. PHONE: Area Code ______ Home: __________ Office: __________ Other: __________

EDUCATION AND TRAINING

Circle Highest Grade Completed: 7 or less 8 9 10 11 12	Did you Graduate? No ☐ Yes ☐ Year:	High School Equivalency Test (G.E.D.) Date Passed: State Awarded:

Type of School	School Name And Location	Type of Diploma or Degree Awarded	Major	Hrs.	Minor	Hrs.	Dates Attended	
							From	To
LAST HIGH SCHOOL ATTENDED								
COLLEGES ATTENDED								
OTHER (Military, Trade, Business, Secretarial, Etc.)								

SPECIAL QUALIFICATIONS (Include active technical/professional licenses, certificates, academic or professional awards, State/Date)

FOREIGN LANGUAGES YOU CAN
☐ Speak ☐ Read ☐ Write

SKILLS:
Typing (W.P.M.) ______ Shorthand (W.P.M.) ______ Other ______
Office machines you can operate:

PER A-2 (Rev. 1/80)

AN EQUAL OPPORTUNITY EMPLOYER
M/F HANDICAPPED

LAST NAME, ______ FIRST ______ M.I. ______

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page 2

6. EMPLOYMENT HISTORY

In the space provided below, give your employment history. Begin with your present or most recent employer and list all positions held, including military, part-time, summer, volunteer work, and any periods of unemployment.

a. NAME OF EMPLOYER: ____________ FROM: ___/___/___ TO: ___/___/___
Month, Day, Year   Month, Day, Year
ADDRESS: ____________
____________ IMMEDIATE SUPERVISOR: ____________
PHONE: ____________ SALARY: ____________ PER: ____________
JOB TITLE: ____________ REASON FOR LEAVING: ____________
Briefly Describe the Work you Performed

b. NAME OF EMPLOYER: ____________ FROM: ___/___/___ TO: ___/___/___
Month, Day, Year   Month, Day, Year
ADDRESS: ____________
____________ IMMEDIATE SUPERVISOR: ____________
PHONE: ____________ SALARY: ____________ PER: ____________
JOB TITLE: ____________ REASON FOR LEAVING: ____________
Briefly Describe the Work you Performed

c. NAME OF EMPLOYER: ____________ FROM: ___/___/___ TO: ___/___/___
Month, Day, Year   Month, Day, Year
ADDRESS: ____________
____________ IMMEDIATE SUPERVISOR: ____________
PHONE: ____________ SALARY: ____________ PER: ____________
JOB TITLE: ____________ REASON FOR LEAVING: ____________
Briefly Describe the Work you Performed

d. NAME OF EMPLOYER: ____________ FROM: ___/___/___ TO: ___/___/___
Month, Day, Year   Month, Day, Year
ADDRESS: ____________
____________ IMMEDIATE SUPERVISOR: ____________
PHONE: ____________ SALARY: ____________ PER: ____________
JOB TITLE: ____________ REASON FOR LEAVING: ____________
Briefly Describe the Work you Performed

e. NAME OF EMPLOYER: ____________ FROM: ___/___/___ TO: ___/___/___
Month, Day, Year   Month, Day, Year
ADDRESS: ____________
____________ IMMEDIATE SUPERVISOR: ____________
PHONE: ____________ SALARY: ____________ PER: ____________
JOB TITLE: ____________ REASON FOR LEAVING: ____________
Briefly Describe the Work you Performed

(If additional space is needed, enter information under item 13, page 4)

STUDENT HANDOUT NO. 3

REFERENCES

7.

LIST THREE PERSONS WHO ARE NOT RELATED TO YOU BY BLOOD OR MARRIAGE WHO HAVE NOT ALREADY BEEN LISTED IN ITEM NO. 6 WHO CAN COMMENT ON YOUR EDUCATION AND/OR WORK EXPERIENCE.

FULL NAME	OCCUPATION	PHONE: OFFICE HOME	ADDRESS	
			STREET	CITY AND STATE
		O: H:		
		O: H:		
		O: H:		

8. CRIMINAL RECORD: Have you ever been convicted of a felony or a crime involving moral turpitude? Moral turpitude includes such crimes as fraud, swindling, and sex-related offenses. You may omit juvenile offenses or convictions that have been set aside after successful completion of a probation period. ☐ Yes ☐ No (If the answer is yes, please give details relating to the date of conviction, place of conviction, the court in which convicted, the case number and the sentence under Item No. 13 - page 4.

9. CONDITION OF HEALTH: Have you had a serious mental or physical illness, major surgery, or sustained an injury which could impede the successful performance of your duties _____ ? Do you have a chronic health condition which could affect the successful performance of your duties _____ ? (If answer is YES to any of the above questions, please explain under Item 13 - page 4.)

10. HAVE YOU EVER BEEN AN EMPLOYEE OF THE WHITTIER HAWKS MANUFACTURING COMPANY ?

If so: Position Title ____________________ Employment Dates ____________ ____________________

School or Organization ____

11. Are you related in any way including by marriage to any board member presently serving on the Board of Trustees? ☐ Yes ☐ No (If so, please indicate person and relationship:

____________________________ ____________________________)

GENERAL INFORMATION

Please be sure you have signed and dated this application on page 4 and answered every question clearly and completely.

Each applicant appointed a position in the district must meet all requirements of the position, including the successful completion of any applicable aptitude test (if required), medical examination and a confidential investigation, and each appointee must submit all requested documents.

12. The following information is requested for Personnel Office Use Only in order to assist us in complying with E.E.O. reporting guidelines:

1. ETHNIC GROUP: American Indian ______ Black ______ Asian American ______ Hispanic ________ Other ______
2. SEX: Male _____ Female _____

AN EQUAL OPPORTUNITY EMPLOYER
M/F HANDICAPPED

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13.

page 4

SPACE FOR DETAILED ANSWERS TO OTHER QUESTIONS

ITEM NUMBER	WRITE IN LEFT COLUMN NUMBER TO WHICH ANSWERS APPLY.

I, the undersigned, affirm that the information included in this application is true and complete. I understand that failure to include true and complete information may result in my disqualification for consideration for employment and/or dismissal from my position in this school district. I also understand that the references and personal information which become a part of this application are regarded as confidential and shall not be revealed to me.

Signature of Applicant ____________________ Date Signed ____________________

WE THANK YOU FOR MAKING APPLICATION FOR EMPLOYMENT WITH
WHITTIER HAWKS MFG. CO.

FOR OFFICE USE ONLY

Date Received ____________________

To Keypunch __________ From Keypunch __________

Application Screened by __________ Date ______

Interviewed by __________ Date __________

Processing Clerks Initial ____________________

Applicant Hired in Position of: ____________________

Title: __________ Job Code: __________

Organization: ____________________

Beginning Date: ____________________

Pay Grade __________ Step __________

REMARKS:

PERSON TO BE CONTACTED IN CASE OF EMERGENCY

____
NAME

____
ADDRESS PHONE

STUDENT HANDOUT NO. 4

WHITTIER HAWKS MANUFACTURING COMPANY

POSITION		SHIFT 1	SHIFT 2	SHIFT 3	SHIFT 4
GENERAL FOREMAN		DAVID ABREGO	JOSE SERNA	ROBERT HERNANDEZ	MIKE ALEXANDER
LINE FOREMAN		KENNETH FLORES	PEDRO CASTRO	RICARDO GARZA	JESSE GARZA
SET-UP FOREMAN		ALBERT JIMENEZ	JUAN GONZALEZ	DANIEL TORRES	JOSE GARZA (BIG)
SAFETY FOREMAN INSPECTOR		SUSANNA GARZA	JOE VILLARREAL	MICHELLE SALINAS	RAYMOND OCHOA
TOOL CRIB FOREMAN		JOHN [illegible]	THOMAS NEUNAYR	THOMAS FERNANDEZ	MARK FRAUSTO
LINE INSPECTORS		RUBEN RODRIGUEZ	DANIEL GARZA	LOUIS ARREZQUITA	PAT RAMOS
CLEAN UP FOREMAN		ANDREW GARCIA	ARTURO CORTEZ	SAL ZAMORA	JOSE GARZA (LITTLE)
MACHINE OPERATOR					
DRILLS	1	JESSE PEREZ	JOHN RODRIGUEZ	JUAN ALVARADO	LARRY BOWDEN
	2	EDUARDO SANCHEZ	DIRK MARTELL	LUPE ALVARADO	ADRIAN ESQUEDA
	3	LUPE NAVAIRA	JUAN LOPEZ	RAYMOND FLORES	DAVID MARTINEZ
PLANER	1	RICARDO BRAVO	RICKY RICARTE	RICHARD GARZA	ALEXANDER MESQUITI
	2	ALEX CORTEZ	JOSE LOPEZ	ROBERT GARZA	DANIEL SAUCEDA
~~SAW~~	3	DANIEL CARLSON	PEDRO CASTRO	MANUEL MARTINEZ	JAMES SILUCK
SAW	1	DAVID ABREGO	JOSE SERNA	ROBERT HERNANDEZ	BIG JOSE GARZA
	2	ALBERT JIMENEZ	ARTURO CORTEZ	ROBERTO MENDOZA	MICHAEL ALEXANDER
SANDER	1	KEN FLORES	JUAN GONZALEZ	DAVID SILVA	ERNEST QUINTERO
	2	RICARDO ALONZO	RAY LAGUE	JEFFERY SILVA	RUBEN RUBALCAVA
ASSEMBLER	1	HECTOR RIOS	PAT ARELLANO	ALAN ZAMARRIPAS	MARK FRAUSTO
	2	EDWARD GARZA	GERARDO CASTILLO	SERGIO VALERIO	PAT RAMOS
	3	RICHARD GONZALES	DANIEL GARZA	RICHARD VALADEZ	NANCY MONTALVO
	4	JOHN [illegible]	CARLOS GONGORA	MICHELLE SALINAS	AUGUSTINE HERNANDEZ
	5	ANDREW GARCIA	XAVIER GONZALES	VERNON REYES	REYNALDO CASTELLANO
	6	SUSANNA GARCIA	JORGE HERNANDEZ	ALFONSO MUNOZ	JOSE GARZA
FINISHER	1	RALPH MARTINEZ	JOSE VILLARREAL	HENRY GARZA	LITTLE JOSE GARZA
	2	MERBEL MEDINA	TOMAS NEUNAYR	THOMAS FERNANDEZ	RAYMOND OCHOA
	3	RUBEN RODRIGUEZ	DIRK MARTELL	LOUIS ARREZQUITA	JOSE SALAZAR
SALES PERSON					
	1			DANIEL TORRES	FRANCISCO SAUCEDA
	2			SAL ZAMORA	

BEST COPY AVAILABLE

6

Computer Applications in Manufacturing

OBJECTIVES

After the students have covered the material in this unit, they should be able to—

1. explain the relationship of computers to manufacturing;
2. give examples of how computers are used in production management;
3. give examples of how computer-aided design (CAD), computer-aided manufacturing (CAM), and computer numerical control (CNC) are used in manufacturing; and
4. give examples of how robotics is used in manufacturing.

KEY WORDS: VOCABULARY

The words in the following list may be new to the students studying manufacturing. Teachers should help students understand these words as they are used in this topic of study.

special-purpose computers
general-purpose computers
computer program
microcomputers
robotics

TEACHING AIDS

- Overhead projector
- Computer programs
- Appendices A and B
- Test Key: 1-B, 2-A, 3-C, 4-D
- Transparencies: You will find transparencies M6-1 through M6-5 at the end of this unit. If you wish, these masters may be duplicated in quantity and given as handouts to the students while they are studying the different aspects of this unit.
  M6-1: Production Management Applications
  M6-2: Computer-Aided Design
  M6-3: Computer-Aided Manufacturing
  M6-4: Computer Numerical Control System
  M6-5: Robotics

SUGGESTED REFERENCES

Arbib, Michael A. Computers and the Cybernetic Society. New York: Academic Press, 1977.

Bame, E.A., and Cummings, P. Exploring Technology. Worchester, Mass.: Davis Publications, 1980.

Convey, H. Dominic, and McAlister, Neil H. Computer Consciousness: Surviving the Automated Eighties. Reading, Mass.: Addison-Wesley Publishing Company, 1980.

Goetsch, David L. The CAD/CAM Workbook. Cincinnati: South-Western Publishing Company, 1983.

Heiner, Carl W., and Hendrix, Wayne R. People Create Technology. Worchester, Mass: Davis Publications, 1980.

Sanders, Donald H. Computers in Society. New York: McGraw-Hill Book Company, 1977.

Weiss, Eric. Computer Usage-Applications. New York: McGraw-Hill Book Company, 1970.

Willis, Jerry, and Miller, Merl. Computers for Everybody. Beaverton, Ore.: Dilithium Press, 1981.

SENTENCE OUTLINE

Note to the teacher: The following information on computers may be presented as a unit by itself. Or you may want to incorporate it in the previous units.

I. Introduction
New applications for computers are constantly being developed. Computers are used in almost every aspect of our lives. They are very important in the field of manufacturing.

Types of computers. Before we discuss the specifics of computers in manufacturing, let's discuss two broad types of computers.

A. **Special-purpose computers** are very limited. They make up only a fraction of all the computers and are designed for just one application. They are wired internally to go through the identical sequence of operations every time. Such special-purpose computers cannot be made to do something new by changing the instruction under which they operate. You can make them do something new only by taking a soldering iron and changing their wiring. The instructions given to a computer are called **computer programs.** So these special-purpose computers are said to be not or nonprogrammable.

B. **General-purpose computers** can be made to do any of a variety of jobs simply by changing the instructions given to them. The wiring remains the same. Only the programs are changed. Such computers need programming, but they are extremely flexible since a mere change in their program changes what they do.

C. Another term that you should be familiar with in discussing the computer is the **microcomputer**. The microcomputer is the size of a desk or smaller. Microcomputers now exist that are as small as a head of a pin.

II. Production management application (Transparency M6-1)
   A. Computers can help one plan, organize, and control.
   B. Computers will provide more efficiency in the company's overall operations because of the ability to store and retrieve information at a high rate of speed.
   C. Personnel data can be stored in the computer for all employees (past and present) as well as projected employment trends.
   D. Manufacturing and economic trends can be stored in the computer so that the company can plan better for the future.
   E. Material and supply data can be stored in the computer. This includes:
      1. inventory control
      2. cost estimation
      3. scheduling and routing of materials
      4. equipment data, repair and maintenance
   F. The scheduling of workers for different jobs can be done on the computer.
   G. Financial data can be stored in the computer as well as graphically represented.
   H. Safety management data can be stored in the computer.

III. Computer-aided design (CAD) (Transparency M6-2)
   A. CAD is using computers to collect data, analyze it into a design, and to produce a final product with increased control and speed.
   B. CAD involves using the plotter, digitizer, absolute systems, incremental systems, and subroutine systems to design and draw structures.
   C. Basic operations
      1. **Input** is the collecting of relevant data to create designs and make working drawings.

   2. **Storage** involves data being processed and held for future use.
   3. **Manipulation** involves the changing, editing, and correcting of designs and drawings.
   4. **Output** is producing the final working drawings in a finished product.
  - D. Uses of CAD in manufacturing
    1. CAD systems are used to design and draw manufactured products.
    2. CAD systems are used to design and draw assembly and working drawings.
    3. CAD systems are used to design and draw routing systems for fabrication and production.

IV. Computer-aided manufacturing (CAM) (Transparency M6-3)
  - A. CAM is used by industry for production planning, quality control, PERT systems, inventory control, machine control, forecasting needs, and safety.
  - B. CAM systems are operated by either a magnetic tape or a punch paper.
  - C. Since CAM systems eliminate human error and handling, it cuts down on overall operating cost of the company and runs continuously.
  - D. CAM systems use CAD data to send commands to the controls and motors that operate the manufacturing equipment.
  - E. CAM systems can be designed to operate robotic units used in automated manufacturing.

V. Computer numerical control (CNC) (Transparency M6-4)
  - A. CNC is a control system that operates controls and motors that perform various machine operations.
  - B. CNC systems are provided instructions from a punched tape.
  - C. CNC systems can be adapted to many manufacturing processes from metalworking operators to photographic processing to drafting plotters.
  - D. CNC systems are highly reliable, cost-saving, and produce products to very close tolerances.

VI. Robotics (Transparency M6-5)
  - A. Webster defines a robot as an automatic apparatus or device that performs functions ordinarily ascribed to human beings or operates with what appears to be almost human intelligence.
  - B. The three laws of robotics
    1. A robot must not harm a human being, nor through inaction, allow one to come to harm.
    2. A robot must always obey human beings, unless that is in conflict with the first law.
    3. A robot must protect itself from harm, unless that is in conflict with the first two laws.
  - C. Robot characteristics
    1. a hand, capable of gripping and releasing the workpiece
    2. an arm, that can move the hand in three planes
    3. a wrist for the arm, with articulation to allow the hand/wrist assembly to be aimed anywhere in the workpiece
    4. sufficient muscle power to accomplish the job
    5. positioning accuracy repeatability to 0.3 mm
    6. manual controls, with which a person can operate all robot limb functions
    7. a built-in memory that can learn the human teacher's instructions
    8. automatic systems that allow the memory to control operations in the absence of the human teacher
    9. a speed of operation that is as fast as a person's
    10. a library of programs that can be selected at will, allowing the robot to be switched back to operations that it has been taught in the past
    11. facilities for safety and process interlocks with the plant or machinery that is to be operated

    12. a computer-compatible interface
    13. reliability of at least 400 hours MTBF (mean time between failure) in the actual working environment
    14. configuration that allows easy maintenance, with quick access and interchangeability of parts in the event of breakdown, aided by self-diagnostic routines

D. Robot qualities already commercially available

    1. work space command with six infinitely controllable articulations between the robot base and its hand extremity
    2. teach and playback facilities—realizing fast, instinctive programming
    3. local and library memories of any size desired
    4. random program selection possible by external stimuli
    5. positioning accuracy repeatability to within 0.3 mm
    6. weight-handling capability up to 150 kilos
    7. point-to-point control and continuous path control, possibly intermixed in one robot
    8. synchronization with moving workpieces
    9. interface allowing compatibility with computer
    10. palletizing and depalletizing capability with computer
    11. high reliability—with no less than 400 hours MTBF
    12. all these capabilities, available for a price that allows purchase and operation within the traditionally accepted rules for economic justification of any new equipment

E. Robot qualities sought for the future

    1. rudimentary sense of vision to provide—
        a. recognition data
        b. orientation data
    2. tactile sensing that gives—
        a. recognition data
        b. orientation data
    3. computer interpretation of the visual and tactile data
    4. multiple-appendage, hand-to-hand coordination
    5. computer-directed appendage trajectories
    6. mobility
    7. minimizing spatial instrusion
    8. energy-conserving musculature
    9. general-purpose hands
    10. man-robot voice communications
    11. total self-diagnostic fault tracing
    12. inherent safety
    13. all these capabilities, available for a price that allows purchase and operation within the traditionally accepted rules for economic justification of any new equipment.

F. Uses in manufacturing

    1. Some robots are designed to handle only a few grams while others can cope with as much as 1,000 KG.
    2. For the most part, robots are used on one sequence of operations, which is then repeated over and over again.
    3. In most cases, a robot can perform the same tasks more reliably than humans.
    4. Robots can outperform humans in hostile working environments, where noise, vibration, smells, or danger act adversely on the physiological system.
    5. Robots do not have to stop to eat, take coffee breaks, or change shifts.
    6. Robots do not get tired, need sleep, or have a family to go home to.
    7. Robots can be designed with much more muscle power than a human.

8. Many tools can be attached to the end of the robot arm.

MATERIALS FOR STUDENTS

- Vocabulary worksheet
- Computer programs

SUGGESTED STUDENT ACTIVITIES

1. Have students work on and develop computer programs related to production management.
2. Have students work on and develop CAD, CAM, and CNC programs related to manufacturing.
3. Have a robotics representative speak to the class on how robots are used in the manufacturing industry.
4. Have students give examples of how computers are used in the manufacturing industry.
5. Have the students write a report on a topic of their choice relative to computer applications in manufacturing technology.
6. Have students use CAD, CAM, CNC systems, and robotic arms in the mass production of a product.

Vocabulary Worksheet

1. special-purpose computers

2. general-purpose computers

3. computer program

4. microcomputers

5. robotics

TEST

Unit 6: Computer Applications in Manufacturing

Directions: Read each statement carefully. Select the word or phrase that correctly answers or completes the statement, and write the appropriate letter in the blank.

Example: __D__ 21. The class that you are in is—

A. Science
B. English
C. Art
D. Industrial Arts

___ 1. Special-purpose computers—

A. outnumber general-purpose computers
B. are few in number in comparison to general computers
C. are equal in number to general-purpose computers
D. none of the above

___ 2. General-purpose computers—

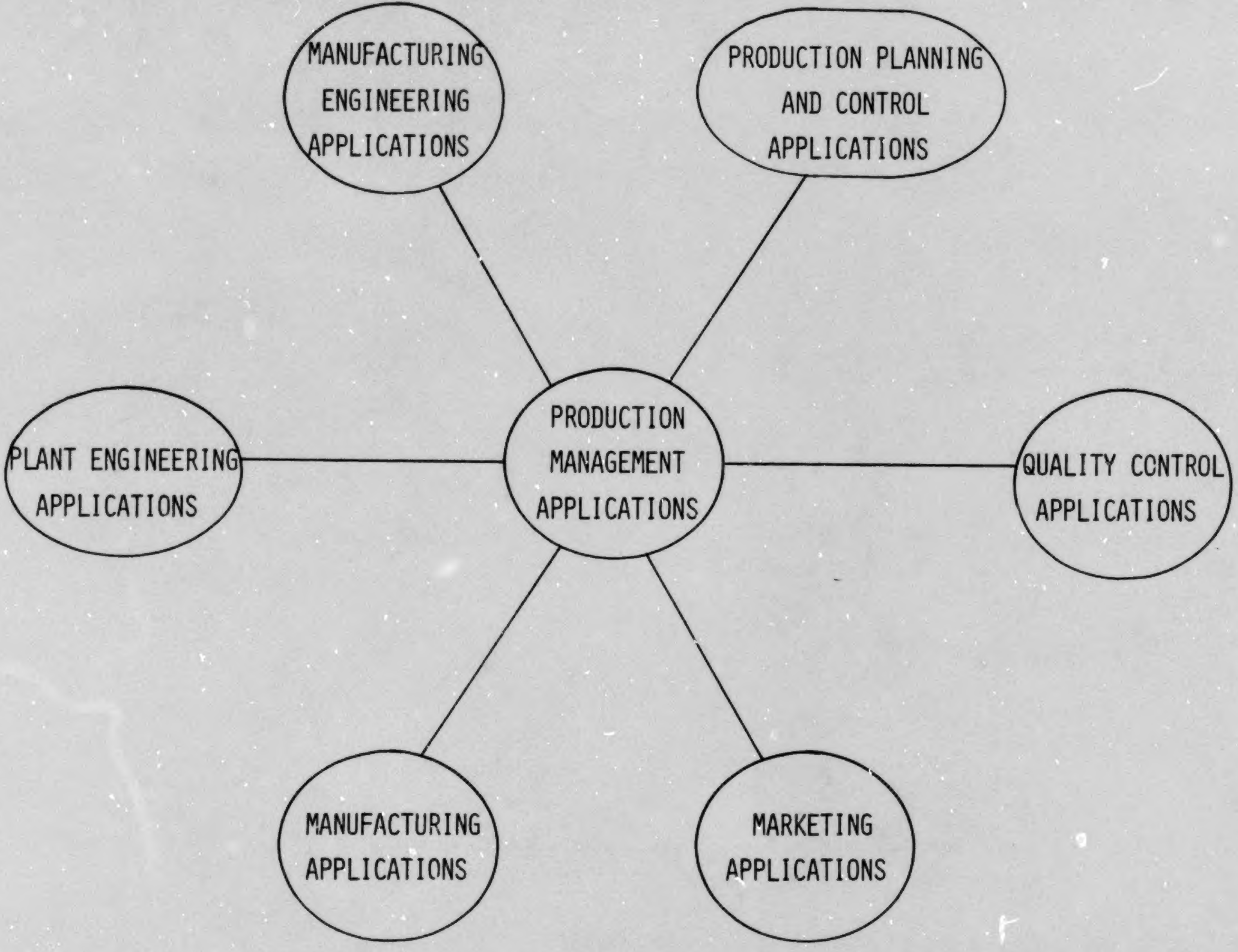
A. can do a variety of jobs
B. can do only one job
C. are not programmable
D. all of the above

___ 3. Computer instructions are called—

A. directions
B. lessons
C. programs
D. assignments

___ 4. Computers that are smaller than the average desk are called—

A. megacomputers
B. millicomputers
C. monocomputers
D. microcomputers



PRODUCTION MANAGEMENT APPLICATIONS

MANUFACTURING ENGINEERING APPLICATIONS

PRODUCTION PLANNING AND CONTROL APPLICATIONS

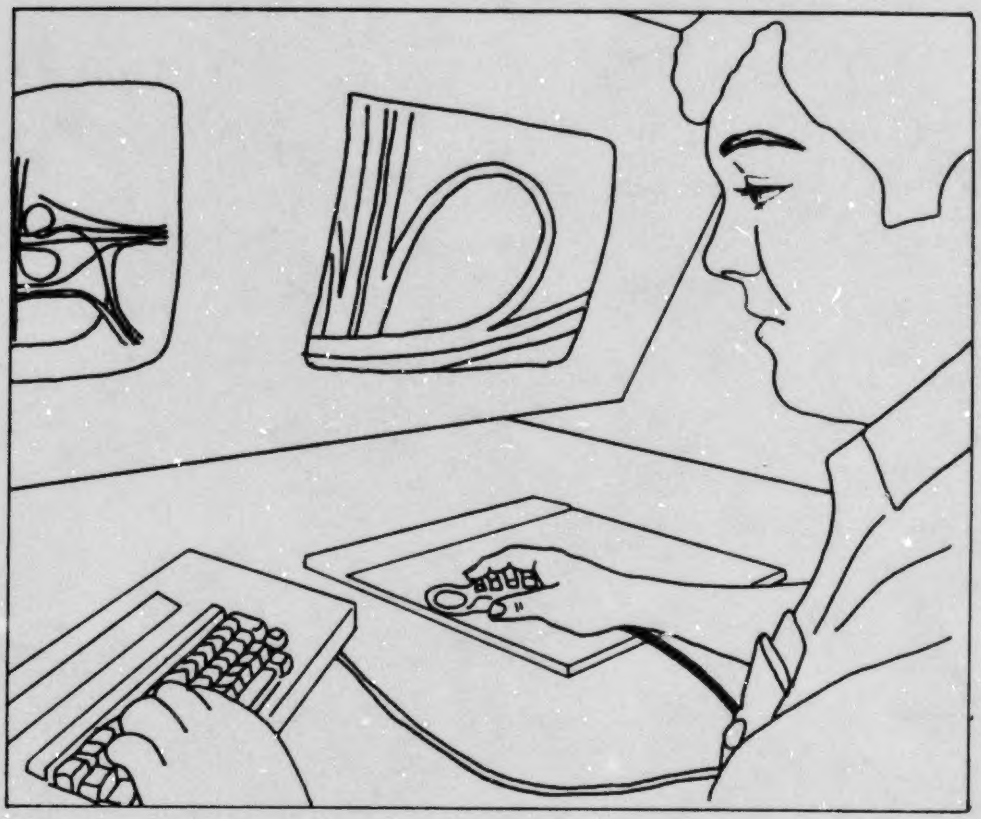
PLANT ENGINEERING APPLICATIONS

QUALITY CONTROL APPLICATIONS

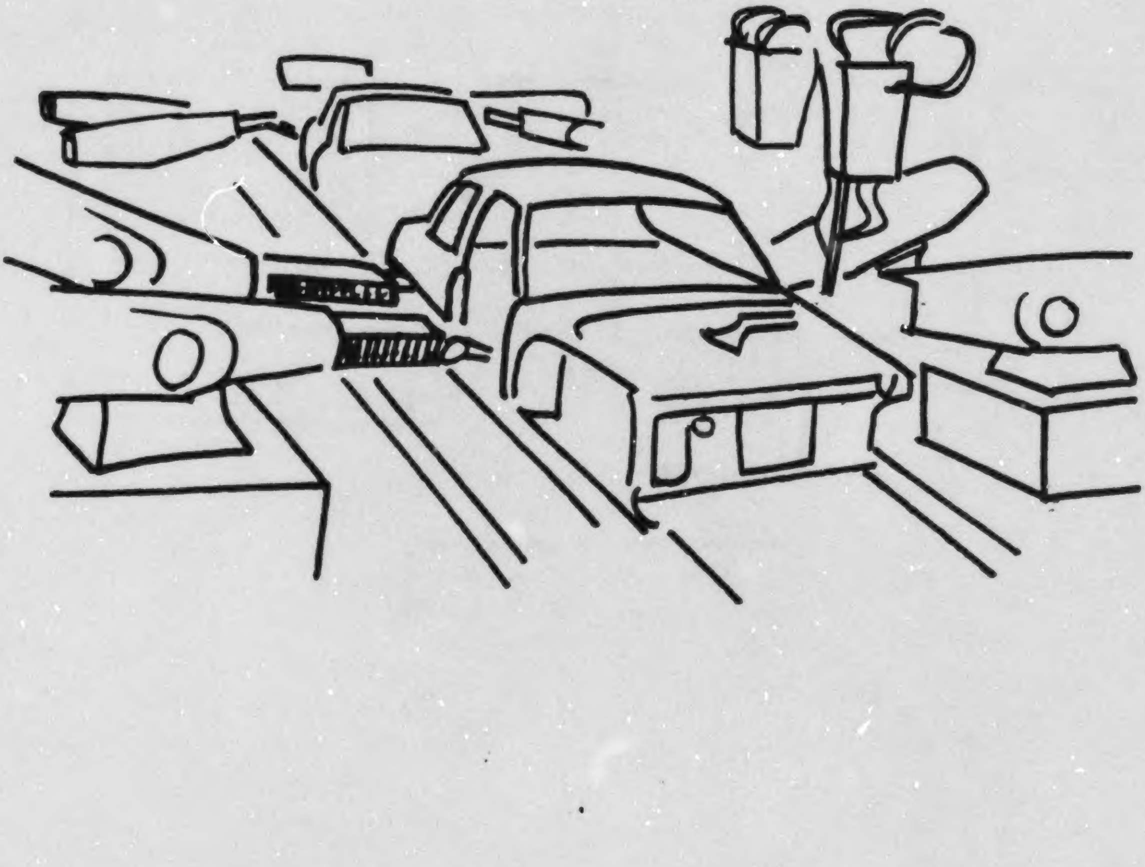
MANUFACTURING APPLICATIONS

MARKETING APPLICATIONS

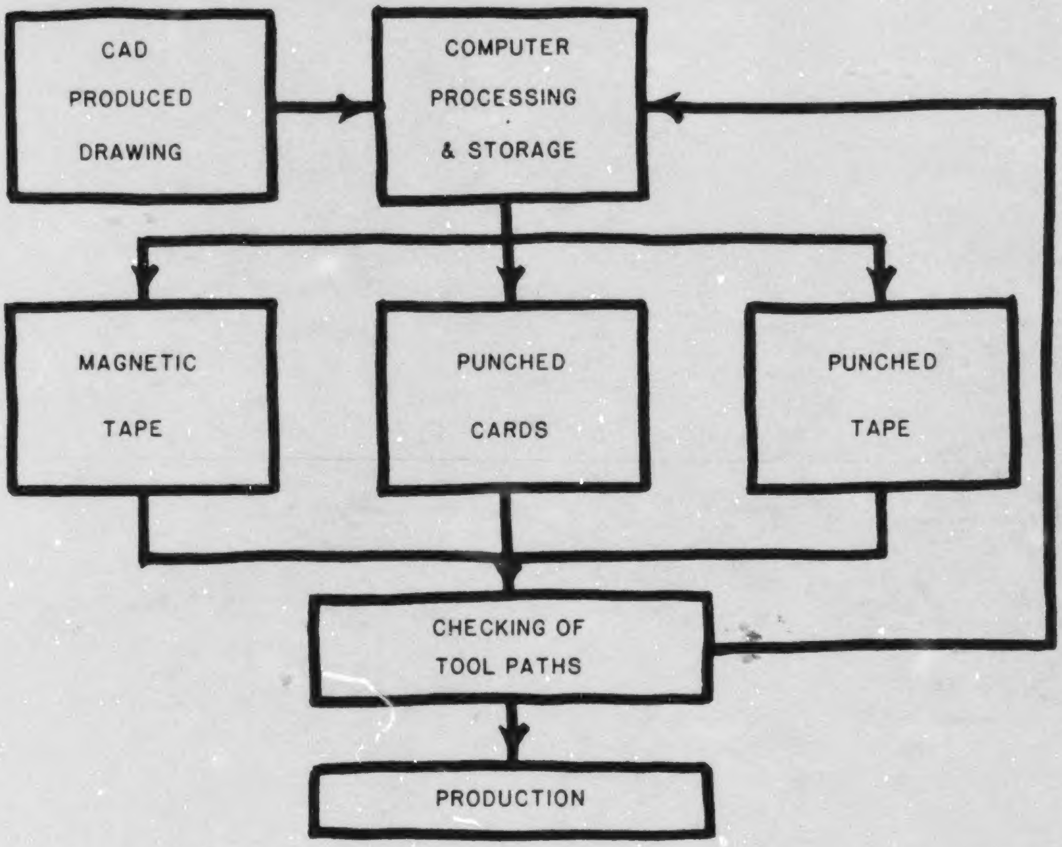
COMPUTER-AIDED DESIGN

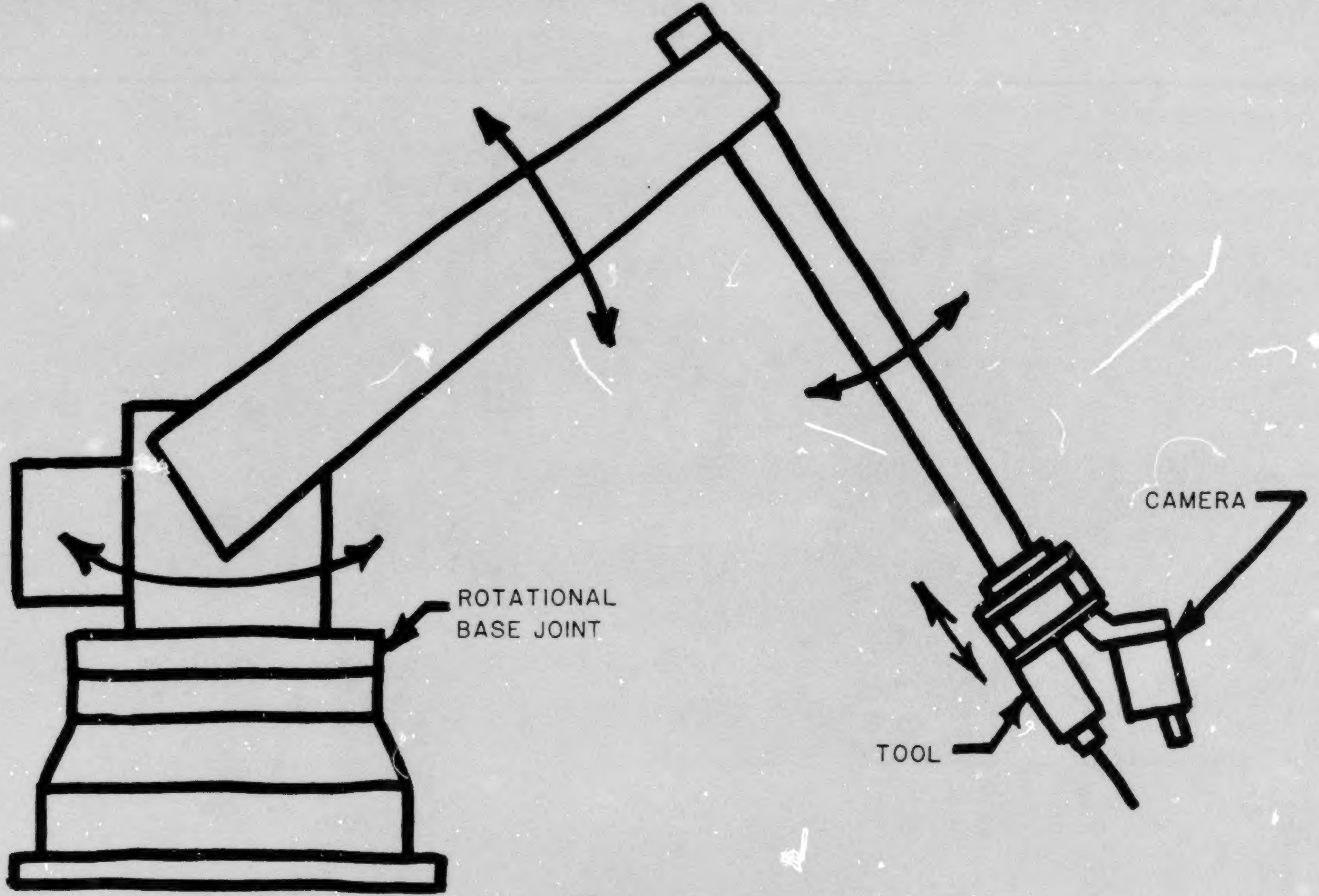


COMPUTER - AIDED MANUFACTURING



Computer Numerical Control System


CAD PRODUCED DRAWING
COMPUTER PROCESSING & STORAGE
MAGNETIC TAPE
PUNCHED CARDS
PUNCHED TAPE
CHECKING OF TOOL PATHS
PRODUCTION


ROTATIONAL
BASE JOINT
CAMERA
TOOL

Robotics

Appendix A: References

Aaker, David A., and Myers, John G. Advertising Management. Englewood Cliffs, N.J.: Prentice-Hall, 1975.

Abramowitz, Irving. Production Management. New York: The Ronald Press Company, 1967.

Alexander, Ralph S.; Cross, James S.; and Hill, Richard M. Industrial Marketing. Homewood, Ill.: Richard D. Irvin, 1967.

American Society of Tool and Manufacturing Engineers. Manufacturing Planning and Estimating Handbook. New York: McGraw-Hill Book Company, 1963.

Apple, James M. Piant Layout and Materials Handling. New York: The Roandl Press Company, 1963.

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Begeman, Myron L., and Amstead, B.H. Manufacturing Processes. Somerset, N.J.: John Wiley and Sons, 1969.

Convey, H. Dominic, and McAlister, Neil H. Computer Consciousness: Surviving the Automated Eighties. Reading, Mass.: Addison-Wesley Publishing Company, 1980.

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Goetsch, David L. The CAD/CAM Workbook. Cincinnati: South-Western Publishing Company, 1980.

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Kirkpatrick, E.G. Quality Control for Managers and Engineers. New York: John Wiley and Sons, 1970.

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Martino, Rocco L. Integrated Manufacturing Systems. New York: McGraw-Hill Book Company, 1972.

Moore, Franklin G., and Kibbey, D.P. Manufacturing: Materials and Processes. Columbus: Grid, 1975.

Patton, W.J. Materials in Industry. Englewood Cliffs, N.J.: Prentice-Hall, 1976.

Roth, Edward S. Functional Inspection Techniques. Dearborn, Mich. American Society of Tool and Manufacturing Engineers, 1967.

Sanders, Donald H. Computers in Society. New York: McGraw-Hill Book Company, 1977.

Talley, Walter J. The Profitable Product: Its Planning, Launching, and Management. Englewood Cliffs, N.J.: Prentice-Hall, 1965.

Thode, Bradley R. Materials Processing. Albany, N.Y.: Delmar Publishers, 1982.

Uman, David B. New Product Programs. New York: American Management Association, 1969.

Weiss, Eric. Computer Usage—Applications. New York: McGraw-Hill Book Company, 1970.

Willis, Jerry, and Miller, Merl. Computers for Everybody. Beaverton, Ore.: Dilithium Press, 1981.

Appendix B: List of Material and Equipment Suppliers

Broadhead-Garrett Company
4560 E. 71st St.
Cleveland, OH 44105

Graves Humphreys, Inc.
1948 Franklin Rd.
Roanoke, VA 24033

Industrial Arts Supply Company
5724 W. 36th Street
Minneapolis, MN 55416

Paxton/Patterson
5719 W. 65th St.
Chicago, IL 60638

Pitsco, Inc.
1004 E. Adams
Pittsburg, KS 66762

SATCO
924 S. 19th Ave.
Minneapolis, MN 55404

Appendix C: Computer Printouts

Manufacturing Technology Computer Programs

Acknowledgments

The following computer programs were developed through a grant to the Department of Technology at Southwest Texas State University, under the direction of Dr. Billy Windham.

Note to the Teacher

The teacher should determine the difficulty level of the following programs and modify them to the appropriate level.

```
RADIO SHACK  TRS-80 AUTHOR I      Lesson: TEXT1
Version: 01/10/84        Page: 11 of 12   Page type: TEXT
---------------------------------------------------------------
        PROGRAM 6.  CLASS CHORE ASSIGNMENTS


        Use this program to randomly assign class-
      room chores to students in order to avoid
      making the same assignment regularly.


        The class role must be entered the first time
      and can be altered with any use. If there are more
      students than chores, more than one student will
      be assigned. If there are more chores than students,
      more chores will be assigned to students.


        The class role and chore list will be saved


        on normal exit from the program.  Both will
      be automatically reloaded when the program is
      run again.


---------------------------------------------------------------
```

```
5 '    USE THIS PROGRAM TO ASSIGN CHORES TO THE STUDENTS OF A
10 ' CLASS. THE PROGRAM WILL ASK FOR THE NAMES OF THE STUDENTS
15 ' AND CHORES ONCE AND THEN SAVE THEM ON DISK. YOU CAN
20 ' CHANGE THEM ANYTIME YOU RUN THE PROGRAM AND THE CORRECT
25 ' VERSION IS SAVED WHEN YOU EXIT THE PROGRAM.
30 '    THE PROGRAM WILL RANDOMLY ASSIGN CHORES TO STUDENTS
35 ' SO THERE IS LITTLE POSSIBILITY OF THE SAME STUDENT BEING
40 ' ASSIGNED THE SAME CHORE ON CONSECUTIVE DAYS.
45 '
100 CLEAR 5000
105 ON ERROR GOTO 500
110 DIM CL$(40),AS(40),CH$(40)
115 OPEN "I",1,"CHORES/EMP"
120 J = 0:W = 0
130 IF EOF(1) THEN 155
132 INPUT#1,CL$(J)
135 IF CL$(J) = "END" THEN 150
140 J = J + 1:GOTO 130
145 GOTO  500
150 IF (EOF(1) OR  CH$(W)="END" ) THEN 155
151 INPUT#1,CH$(W)
152 W = W + 1:GOTO 150
153 W = W-1:J = J-1
155 CLS:PRINT@145,"THE CLASS CHORE ASSIGNMENT PROGRAM"
160 PRINT@267,"CLASSROOM CHORES ARE ASSIGNED IN A RANDOM ORDER."
165 PRINT"THE NAMES AND CHORES ARE STORED ON DISK AFTER THEY ARE
    ENTERED  WITH THE FIRST USE."
167 GOSUB 4000                         ' **** WAIT LOOP
170 '
175 GOSUB 1000                    ' ASK FOR ANY CHANGES
180 '
185 IF A$<>"N" THEN 160
190 GOSUB 2500                    ' MAKE RANDOM ASSIGNMENTS
195 GOSUB 3000                    ' ASK IF PRINTOUT IS WANTED
200 GOSUB 3500                    ' EXIT?
205 IF A = 1 THEN 190
210 GOTO 5000                     ' CALL EXIT
215 '
220 '
500 CLS:PRINT"                         THE STUDENT ROLE":PRINT@139,
    "HOW MANY STUDENTS ARE IN THE CLASS?"
505 PRINT@267,"PLEASE PRESS ENTER AFTER YOUR ANSWER."
510 FOR I = 0 TO 40:CL$(I)="                    ":CH$="      ":NEXT I
512 INPUT J
515 IF J<2 OR J>40 THEN 500
520 CLS:PRINT@133,"TYPE IN THE STUDENTS NAMES AND PRESS ENTER
    AFTER EACH ONE."
525 FOR I = 1 TO J
530   INPUT CL$(I-1)
535 NEXT I
555 '
560 GOSUB 1580                         'PRINT CLASS ON SCREEN
565 GOSUB 4000                         ' **** WAIT LOOP
570 '
575 CLS:PRINT@139,"HOW MANY CHORES ARE THERE TO BE ASSIGNED?"
580 INPUT W
585 IF W < 1 OR W > 40 THEN 575
590 CLS:PRINT@321,"TYPE IN A DESCRIPTION (20 CHARACTERS OR LESS)
    OF EACH CHORE."
```

```
600 FOR I = 0 TO W - 1
605    INPUT CH$(I)
610 NEXT I
615 K = INT(.5+W/2):GOSUB 900
620 GOSUB 4000                          ' **** WAIT LOOP
625 GOTO 155
630 '
900 ' THIS ROUTINE LIST THE CLASS CHORES.
905 CLS:L=0:F=0:N=W-1:CA=0
910 P=N:IF P > 10 THEN P = 10
915 PRINT@75,"     THE CHORE LIST":FOR I = L TO P STEP 2
920      PRINT TAB(5);I+1;CH$(I);TAB(30);I+2;CH$(I+1)
925 NEXT I
930 IF F = 1 THEN 995
935 GOSUB 4200:N = N - 10
940 IF AS$="C" THEN 995
945 IF N < 10 THEN 990
950 L=P:P=P+10
955 FOR I = 128 TO 704 STEP 64:PRINT@I,"
960 GOTO915
990 L=P+1:P=J-1:F=1:GOTO 915
995 RETURN
1000 CLS:PRINT@139,"IF YOU WISH TO MAKE CHANGES IN THE CLASS
     ROLE TYPE C.              IF A CHORE CHANGE IS NEEDED TYPE W."
1005 PRINT@267,"TYPE N IF NO CHANGES ARE NEEDED."
1010 A$ = INKEY$: IF A$ = "" THEN 1010
1015 IF A$ = "N" THEN 1040
1020 IF A$ = "C" THEN GOSUB 1500
1025 IF A$ = "W" THEN GOSUB 2000
1030 GOTO 1000
1035 '
1040 RETURN
1500 ' THIS ROUTINE ALLOWS THE USER TO ALTER THE CLASS ROLE.
1505 GOSUB 1580
1510 PRINT"TYPE :":FOR I = 576 TO 639:PRINT@I," ":NEXTI
1515 PRINT"               1  TO CHANGE A NAME."
1520 PRINT"               2  TO ADD NAMES."
1525 PRINT"               3  TO DELETE NAMES."
1530 INPUT C
1535 IF C < 1 OR C > 3 THEN 1510
1540 '
1545 ON C GOTO 1700,1770,1890
1550 '
1580 PRINT:CLS:L=0:F=0:N=J-1:CA=0
1582 P=N:IF P>10 THEN P=10
1584 CLS:PRINT@75,"     THE CLASS ROLE":PRINT:  FOR I = L TO
     P STEP 2
1586      PRINTTAB(5);I+1;CL$(I);TAB(30);I+2;CL$(I+1)
1588   NEXT I
1590 IF F = 1 THEN 1610
1592 GOSUB 4200:N = N - 10
1593 IF AS$ = "C" THEN 1610
1594 IF N < 10 THEN 1600
1596 L = P :P = P + 10
1597 FOR I = 128 TO 704 STEP 64:PRINT@I,"
1598 GOTO 1584
1600 L = P+1:P = J-1:F = 1:GOTO 1584
1610 RETURN
```

```
1615 '
1620 PRINT@907,"DO YOU WANT TO MAKE ANY MORE CHANGES?"
1625 PRINT"TYPE Y (YES) OR N (NO)."
1630 A$ = INKEY$:IF A$ = "" THEN 1630
1640 RETURN
1645 '
1700 '
1705 PRINT "ENTER THE NUMBER OF THE NAME TO BE CHANGED."
1710 INPUT C
1715 IF C < 1 OR C > 40 THEN 1705
1720 PRINT "TYPE IN THE NEW NAME AND PRESS ENTER."
1725 INPUT CL$(C-1)
1730 GOSUB 4000           ' PRINT CLASS AND WAIT
1745 RETURN
1770 K = 40 - J
1775 CLS:PRINT"THERE ARE ";K;"AVAILABLE AREAS FOR NEW NAMES"
1780 PRINT"HOW MANY NEW NAMES ARE TO BE ADDED?"
1785 INPUT L
1790 IF L > K THEN 1770
1795 PRINT "TYPE IN EACH NAME AND PRESS ENTER."
1800 FOR I = J TO J+L-1
1805   INPUT CL$(I)
1810 NEXT I
1815 J = J + L
1820 '
1825 GOSUB 1620
1835 IF A$ = "Y" THEN 1505
1840 RETURN
1890 '
1895 '
1900 '
1915   PRINT"ENTER THE NUMBER OF THE NAME TO BE DELETED."
1920   INPUT L
1925   FOR N = L TO J-1
1930     CL$(N-1) = CL$(N)
1940     J = J - 1
1945   NEXT N
1947 CL$(J) = "                    "
1955 '
1965 GOSUB 1620
1970 IF A$ = "Y" THEN 1505
1975 RETURN
2000 GOSUB 900                   ' PRINT CHORES
2005 PRINT" TYPE IN :"
2010 PRINT"           1  TO CHANGE A CHORE."
2015 PRINT"           2  TO ADD CHORES."
2020 PRINT"           3  TO DELETE CHORES."
2025 '
2030 INPUT C
2035 IF C < 1 OR C > 3 THEN 2000
2040 ON C GOTO 2100,2200,2300
2100 '
2105 PRINT"ENTER THE NUMBER OF THE CHORE TO BE CHANGED."
2110 INPUT C
2115 IF C < 0 OR C > 40 THEN 2000
2120 PRINT " TYPE IN THE NEW CHORE AND PRESS ENTER."
2125 INPUT CH$(C-1)
```

```
2130 '
2135 GOSUB 1620                    ' ASK FOR MORE CHANGES
2140 IF A$ = "Y" THEN 2000
2145 RETURN
2150 '
2200 CLS:K = 40 - W
2205 PRINT " THERE ARE ";K;" AVAILABLE AREAS FOR NEW CHORES."
2210 PRINT " HOW MANY NEW CHORES ARE TO BE ADDED?"
2215 INPUT L
2220 IF L > K THEN 2200
2225 PRINT " TYPE IN EACH NEW CHORE AND PRESS ENTER."
2230 FOR 1 = W+1 TO W+L
2235   INPUT CH$(I)
2240 NEXT 1
2245 W = W + L
2250 '
2255 GOSUB 1620
2260 IF A$ = "Y" THEN 2000
2265 RETURN
2270 '
2300 '
2330   PRINT"ENTER THE NUMBER OF THE CHORE TO BE DELETED."
2335   INPUT L
2340   FOR N = L TO W-1
2345     CH$(N-1) = CH$(N)
2355  NEXT N
2360 W = W-1
2363 CH$ = "                    "
2370 '
2375 '
2380 GOSUB 1620
2385 IF A$ = "Y" THEN 2000
2390 RETURN
2395 '
2480 '
2500 ' THIS SECTION MAKES THE RANDON ASSIGNMENTS.
2502 FOR 1 = 0 TO 39:AS(I) = 0:NEXT·I
2505 CLS:PRINT@535,"WORKING"
2507 G = 0
2510 FOR I = 0 TO W-1
2515   FLAG = 0:S = RND(0):S = INT (S*(W+1))
2520   FOR K = 0 TO W-1
2525     IF (S=AS(K)) FLAG = 1
2526     PRINT@139," FINDING AN ASSIGNMENT FOR ";CL$(G)
2530   NEXT K
2535   IF FLAG = 1 THEN 2515
2537 PRINT@165,"                    "
2538 G = G + 1:IF G > J-1 THEN G = 0
2540 AS(I) = S:NEXT I
2545 '
2550 RETURN
3000 '    *** LIST  ASSIGNMENTS 10 AT A TIME. ***
3005 '
3010 CLS:L=0:F = 0
3015 N = J-1:CA = 0
3020 P = N: IF P >10 THEN P = 10
3025   FOR I = L TO P
3030      M = AS(CA)
```

```
3035      PRINT TAB(5);CL$(I);TAB(25):CH$(M)
3037     CA = CA + 1:IF CA > W-1 THEN CA = 0
3040   NEXT I
3045 PRINT:PRINT"    MORE ON NEXT PAGE":GOSUB 4000
3050 IF F = 1 THEN 3100
3055 N = N -10
3060 IF N < 10 THEN 3080
3065   L = P+1:P = P+10
3070   GOTO 3025
3075 '
3080 L = P+1:P = J-1:F = 1:GOTO 3025
3100 PRINT:PRINT"   PRESS S TO RELIST THE ASSIGNMENTS OR
     C TO CONTINUE."
3105 E$ = INKEY$: IF E$ <>"S" AND E$ <> "C" THEN 3105
3110 IF E$ = "S" THEN 3010
3115 RETURN
3500 CLS:PRINT@139,"ENTER  "
3505 PRINT"                 1. TO REASSIGN THE CHORES."
3510 PRINT"                 2. TO EXIT AND SAVE THE CHANGES."
3515 PRINT"                 3. TO EXIT AND SAVE THE ORIGINAL DATA."
3517 PRINT"                 4. TO EXIT AND LIST ON LINE PRINTER."
3520 INPUT A
3525 IF A<>1 AND A<>2 AND A<>3 AND A<>4 THEN 3500
3530 ON A GOTO 3550,3600,3550,3700
3550 RETURN
3600 OPEN "O",1,"CHORES/EMP"
3605 FOR I = 0 TO J-1
3610  PRINT#1,CL$(I)
3615 NEXT I
3616 CL$(J) = "END":PRINT#1,CL$(J)
3617 FOR I = 0 TO W-1
3618 PRINT #1,CH$(I):NEXTI
3619 CH$(W) = "END":PRINT#1,CH$(W)
3620 CLOSE
3625 RETURN
3700 'LIST ON LINE PRINTER
3705 '
3710 LPRINT CHR$(12)
3715   LPRINT TAB(25);" *****  CLASS CHORE ASSIGNMENTS *****"
3720 LPRINT" "
3725 FOR I = 0 TO W-1
3735   LPRINT TAB(15);CL$(I);TAB(50);CH$(AS(I))
3740 NEXTI
3742 LPRINT CHR$(12)
3745 RETURN
4000  ' ************  WAIT FOR USER RESPONSE **********
4005 '
4010 PRINT@967,"PRESS C TO CONTINUE."
4015 S$=INKEY$:IF S$<>"C" THEN 4015
4020 RETURN
4025 '
4030 '
4200 '        *** USER INPUT ON CHANGE  ***
4205 '
4210 PRINT "ENTER P TO SEE MORE OF THE LIST OR C TO CHANGE
     AN ELEMENT SHOWN."
4215 AS$ = INKEY$: IF AS$<>"P" AND AS$<>"C" THEN4215
4220 RETURN
5000 END
```

CONVERSIONS

The first set of programs we have are convertion programs. They convert from English measure to Metric. These are very simple and easy to type in programs.

The first program is "INCHES TO CENTIMETERS". This program converts inches to centimeters. While typing it in you do not have to type the "REM", or "REMARK", statements. They are there simply to let you know what the program is doing at a given point.

This program first reads in the number of inches to be converted. Then it converts them, and finally it prints out the convertion. For example, say you wanted to find out how many centimeters are in a yard strick. You would enter 36 for the number of inches and the program would output the convertion.

Here then is a sample run and a listing of the program.

```
LOAD INCHES TO CENTIMETERS,D1
]RUN
     ENTER THE NUMBER OF INCHES TO BE
CONVERTED TO CENTIMETERS, IN DECIMAL
FORM?36
     36 INCHES = 91.44 CENTIMETERS.
     A = ANOTHER    E = END

]LIST

10  REM CHANGE INCHES TO
20  REM CENTIMETERS.
30  REM
35  HOME : PRINT : PRINT : PRINT

40  REM INPUT # OF INCHES
50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF INCHES TO BE"
60  PRINT "CONVERTED TO CENTIMETE
     RS, IN DECIMAL"
65  PRINT "FORM";: INPUT I
70  REM CONVERT TO CENTIMETERS
80 C = I * 2.54
90  REM OUTPUT ANSWER
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)I;" INCHES = "
     ;C;" CENTIMETERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 35
160  END

]
```

The second program is "INCHES TO MM" (MM means milimeters). This program converts inches to milimeters. It first ask for the number of inches to be converted. Then it converts to milimeters, and finally it outputs the convertion. For example, say you have a six-inch ruler and you wanted to know how many milimeters are in the ruler. You would input 6 to the program and it would output the convertion to milimeters.

Here is a sample run and listing of the program.

```
LOAD INCHES TO MM
]RUN



    ENTER THE NUMBER OF INCHES TO BE
CONVERTED TO MM, IN DECIMAL FORM?6



    6 INCHES = 152.4 MILIMETERS.



    A = ANOTHER   E = END

]LIST

10  REM CHANGE INCHES TO
20  REM MILIMETERS.
30  REM
35  HOME : PRINT : PRINT : PRINT

40  REM INPUT # OF INCHES
50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF INCHES TO BE"
60  PRINT "CONVERTED TO MM, IN DE
     CIMAL FORM";: INPUT I
70  REM CONVERT TO MILIMETERS
80 MM = I * 25.4
90  REM OUTPUT ANSWER
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)I;" INCHES = "
     ;MM;" MILIMETERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 35
160  END

]
```

The third program is "FEET TO CM". This program converts feet to centimeters. It first reads in the number of feet. Then it convert them to centimeters, and finally it outputs the convertion. An example would be if you wanted to no how many centimeters are in a square(100 square feet). You would first type in 100 for the number of feet, then the program would output the convertion to centimeters.

Here is a sample run and listing of the program.

```
RUN FEET TO CM


    ENTER THE NUMBER OF FEET TO BE
CONVERTED TO CM, IN DECIMAL FORM?100


    100 FEET = 3048 CENTIMETERS.


    A = ANOTHER   E = END

]LIST

10  REM CONVERT FEET TO CM
20  REM
30  REM INPUT THE # OF FEET
35  HOME : PRINT : PRINT : PRINT

40  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF FEET TO BE"
50  PRINT "CONVERTED TO CM, IN DE
     CIMAL FORM";: INPUT F
60  REM CONVERT TO CM
70 CM = F * 30.48
80  REM OUTPUT CONVERTION
85  PRINT : PRINT : PRINT
90  PRINT  TAB( 5)F;" FEET = ";CM
     ;" CENTIMETERS."
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)"A = ANOTHER
      E = END"
120  GET A$
130  IF A$ = "A" GOTO 35
140  END

]
```

The next program is "FEET TO METERS". This program will read in the number of feet to be converted, then it will convert them to meters, and finally it will output the convertion. For example, say you wanted to know how many meters there are from the floor to an eight foot cieling is. You would enter 8, and the program would output the number of meters there are in eight feet.

Here is a sample run and listing of the program.

```
RUN FEET TO METERS



    ENTER THE NUMBER OF FEET TO BE
CONVERTED TO METERS?8



    8 FEET = 2.4384 METERS.



    A = ANOTHER   E = END

]LIST

10  REM CONVERT FEET TO METERS
20  REM
30  REM INPUT THE # OF FEET
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF FEET TO BE"
60  PRINT "CONVERTED TO METERS";:
       INPUT F
70  REM CONVERT TO METERS
80 M = F * .3048
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)F;" FEET = ";M
    ;" METERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "YARDS TO CM". This program converts yards to centimeters. It will first read in the number of yards, then convert them to centimeters, and finally output the convertion. For example say you wanted to know how many centimeters are in three yards of fabric. You would enter three as the number of yards to be converted and the program would report the convertion to centimeters.

Here is a sample run and listing of the program.

```
RUNYARDS TO CM



    ENTER THE NUMBER OF YARDS TO BE
CONVERTED TO CM, IN DECIMAL FORM?3



    3 YARDS = 274.32 CENTIMETERS.



    A = ANOTHER   E = END

]LIST

10  REM CONVERT YARDS TO CM
20  REM
30  REM INPUT THE # OF YARDS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF YARDS TO BE"
60  PRINT "CONVERTED TO CM, IN DE
     CIMAL FORM";: INPUT Y
70  REM CONVERT TO CM
80 CM = Y * 91.44
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)Y;" YARDS = ";
     CM;" CENTIMETERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

the next program is "YARDS TO METERS". This program will convert yards to meters. First it reads in the number of yards to be converted, then it converts them to meters, and finally it outputs the convertion. An example would be if you wanted to know how many meters are in the 100 yard dash. You would first enter 100 as the number of yards to be converted, then the program would output the convertion in meters.

Here is a sample run and listing of the program.

```
RUN YARDS TO METERS



     ENTER THE NUMBER OF YARDS TO BE
CONVERTED TO METERS, IN DECIMAL FORM?100



     100 YARDS = 91.44 METERS.



     A = ANOTHER    E = END

]LIST

10   REM CONVERT YARDS TO METERS
20   REM
30   REM INPUT THE # OF YARDS
40   HOME : PRINT : PRINT : PRINT

50   PRINT  TAB( 5)"ENTER THE NUMB
      ER OF YARDS TO BE"
60   PRINT "CONVERTED TO METERS, I
      N DECIMAL FORM";: INPUT Y
70   REM CONVERT TO METERS
80 M = Y * .9144
90   REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)Y;" YARDS = ";
     M;" METERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "MILES TO METERS". This program will read in the number of miles, convert them to meters, and output the convertion. An example would be determining the number of meters in a mile. To do this you would enter 1 as the number of miles to be converted, then the program would output the number of meters in a mile.

Here is a sample run and listing of the program.

```
RUN MILES TO METERS


    ENTER THE NUMBER OF MILES TO BE
CONVERTED TO METERS, IN DECIMAL FORM?1


    1 MILES = 1609.344 METERS.


    A = ANOTHER   E = END

]LIST

10  REM CONVERT MILES TO METERS
20  REM
30  REM INPUT THE # OF MILES
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF MILES TO BE"
60  PRINT "CONVERTED TO METERS, I
     N DECIMAL FORM";: INPUT MI
70  REM CONVERT TO METERS
80 ME = MI * 1609.344
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)MI;" MILES = "
     ;ME;" METERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "MILES TO KILOMETERS". This program will convert miles to kilometers. It first reads in the number of miles, then converts them to kilometers, and finally outputs the convertion. For instance say you had to go on a trip of 512 miles, and you wanted to know how many kilometres it would be. To determine this you would enter 512 and the program would output the convertion in kilometers.

Here is a sample run and listing of the program.

```
RUN MILES TO KILOMETERS



    ENTER THE NUMBER OF MILES TO BE
CONVERTED TO KILOMETERS, IN DECIMAL
FORM?512



    512 MILES = 823.984128 KILOMETERS.



    A = ANOTHER    E = END

]LIST

10  REM CONVERT MILES TO
15  REM KILOMETERS
20  REM
30  REM INPUT THE # OF MILES
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF MILES TO BE"
60  PRINT "CONVERTED TO KILOMETER
     S, IN DECIMAL"
65  PRINT "FORM";: INPUT M
70  REM CONVERT TO KILOMETERS
80 K = M * 1.609344
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)M;" MILES = ";
    K;" KILOMETERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "CENTIMETERS TO INCHES". This program converts centimeters to inches. It will read in the number of centimeters, then convert them to inches, and finally output the convertion. For instance, say you wanted to know how many inches were in the diameter of a circle, if the circle had a diameter of 6 centimeters. You could find this out by running the program and entering 6 as the number of centimeters to be converted. The progam would output the number of inches in 6 centimteres.

Here is a sample run and listing of the program.

```
RUN CENTIMETERS TO INCHES


    ENTER THE NUMBER OF CENTIMETES
TO BE CONVERTED TO INCHES, IN DECIMAL?6


    6 CENTIMETER = 2.3622 INCHES.


    A = ANOTHER    E = END

]LIST

10  REM CONVERT CENTIMETERS TO IN

20  REM INPUT THE # OF
30  REM CENTIMETERS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF CENTIMETES"
60  PRINT "TO BE CONVERTED TO INC
     HES, IN DECIMAL";: INPUT C
70  REM CONVERT TO INCHES
80 I = C * .3937
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)C;" CENTIMETER
      = ";I;" INCHES."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "CENTIMETERS TO FEET". This program will convert centimeters to feet. It will read in the number of centimters to be converted, convert them to feet and output the convertion. An example would be if you wanted to know how many feet are in 500 square centimeters. You could find this out by entering 500 as the number of centimeters to be converted to feet. The program would output the number of feet in 500 centimeters.

Here is a sample run and listing of the program.

```
RUN CENTIMETERS TO FEET


    ENTER THE NUMBER OF CENTIMETES
TO BE CONVERTED TO FEET, IN DECIMAL?500


    500 CENTIMETERS = 16.4041995 FEET.


    A = ANOTHER    E = END

]LIST

10  REM CONVERT CENTIMETERS TO FT

20  REM INPUT THE # OF
30  REM CENTIMETERS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF CENTIMETES"
60  PRINT "TO BE CONVERTED TO FEE
     T, IN DECIMAL";: INPUT C
70  REM CONVERT TO FEET
80 F = C / 30.48
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)C;" CENTIMETER
     S = ";F;" FEET."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "METERS TO FEET". This program will read in the number of meters, convert them to feet, and output the convertion. For instance, say you wanted to know how many feet are in 100 meters. You would enter 100 and the program would output the number of feet.

Here is a sample run and listing of the program.

```
RUN METERS TO FEET



     ENTER THE NUMBER OF METERS TO BE
CONVERTED TO FEET, IN DECIMAL FORM?100



     100 METERS = 328.1 FEET.



     A = ANOTHER   E = END

]LIST

10  REM CONVERT METERS TO FEET
20  REM
30  REM INPUT THE # OF METERS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF METERS TO BE"
60  PRINT "CONVERTED TO FEET, IN
     DECIMAL FORM";: INPUT M
70  REM CONVERT TO FEET
80 F = M * 3.281
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)M;" METERS = "
     ;F;" FEET."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "METERS TO YARDS". This program will read in the number of meters to be converted, convert them to yards, and output the convertion. For instance, say you wanted to know how many yards are in the 300 meter High Herdles. You would enter 300 and the program would output the number of yards.

Here is a sample run and listing opf the program.

```
RUN METERS TO YARDS



    ENTER THE NUMBER OF METERS TO BE
CONVERTED TO YARDS, IN DECIMAL FORM?300



    300 METERS = 328.2 YARDS.



    A = ANOTHER   E = END

]LIST

10  REM CONVERT METERS TO YARDS
20  REM
30  REM INPUT THE # OF METERS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF METERS TO BE"
60  PRINT "CONVERTED TO YARDS, IN
      DECIMAL FORM";: INPUT M
70  REM CONVERT TO YARDS
80 Y = M * 1.094
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)M;" METERS = "
     ;Y;" YARDS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "KILOMETERS TO YARDS". This program will read in the number of kilometers to be converted, convert them to yards, and output the convertion. An example would be finding the number of yards in a kilometer. You would enter 1, and the program would output the number of yards in a kilometer.

Here is a sample run and listing of the program.

```
RUN KILOMETERS TO YARDS


    ENTER THE NUMBER OF KILOMETERS
TO BE CONVERTED TO YARDS, IN DECIMAL?1


    1 KILOMETERS = 1094 YARDS.


    A = ANOTHER   E = END

]LIST

10  REM CONVERT KILOMETERS TO
15  REM YARDS
20  REM
30  REM INPUT THE # OF
35  REM KILOMETERS.
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF KILOMETERS"
60  PRINT "TO BE CONVERTED TO YAR
     DS, IN DECIMAL";: INPUT K
70  REM CONVERT TO YARDS
80 Y = K * 1094
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)K;" KILOMETERS
      = ";Y;" YARDS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "KILOMETERS TO MILES". This program will read in the number of kilometers, convert them to miles, and output the convertion. For instance, say you see a distance on a European map of 12 kilometers, and you want to know how many miles that is. You could find this out by running this program, entering twelve for the number of kilometers to be converted, and the program would output the number of miles in 12 kilometers.

Here is a sample run and listing of the program

```
RUN KILOMETERS TO MILES


    ENTER THE NUMBER OF KILOMETERS
TO BE CONVERTED TO MILES, IN DECIMAL?12


    12 KILOMETERS = 7.4568 MILES.


    A = ANOTHER    E = END

]LIST

10  REM CONVERT KILOMETERS TO
15  REM MILES
20  REM
30  REM INPUT THE # OF
35  REM KILOMETERS.
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF KILOMETERS"
60  PRINT "TO BE CONVERTED TO MIL
     ES, IN DECIMAL";: INPUT K
70  REM CONVERT TO MILES
80 M = K * .6214
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)K;" KILOMETERS
      = ";M;" MILES."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "GALLONS TO LITERS". This program will read in the number of gallons to be converted, convert them to liters, and output the convertion. Say you wanted to determine how many liter coke bottles it would take to fill a gallon milk jug. You could do this by running this program and entering 1 as the number of gallons to be converted. The program would then output the number number of liters it would take to fill a gallon jug.

Here is a sample run and listing of the program.

```
RUN GALLONS TO LITERS



    ENTER THE NUMBER OF GALLONS TO BE
CONVERTED TO LITERS, IN DECIMAL FORM?1



    1 GALLONS = 3.78501136 LITERS.



    A = ANOTHER   E = END

]LIST

10  REM CONVERT GALLONS TO
15  REM LITERS.
20  REM
30  REM INPUT THE # OF GALLONS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF GALLONS TO BE"
60  PRINT "CONVERTED TO LITERS, I
     N DECIMAL FORM";: INPUT G
70  REM CONVERT TO LITERS
80 L = G / .2642
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)G;" GALLONS =
      ";L;" LITERS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

the next program is "LITERS TO GALLONS". This program will read in the number of liters, convert them to gallons and output the convertion. For instance, say your car has a 50 liter gas tank and you want to know how many gallons are in 50 liters. You could determine this by running this program and inputing 50 as the number of liters. The program would then output the number of gallons in 50 liters.

Here is a sample run and listing of the program.

```
RUN LITERS TO GALLONS


     ENTER THE NUMBER OF LITERS TO BE
CONVERTED TO GALLONS, IN DECIMAL FORM?50


     50 LITERS = 13.21 GALLONS.


     A = ANOTHER    E = END

]LIST

10  REM CONVERT LITERS TO
15  REM GALLONS.
20  REM
30  REM INPUT THE # OF LITERS
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE NUMB
     ER OF LITERS TO BE"
60  PRINT "CONVERTED TO GALLONS,
     IN DECIMAL FORM";: INPUT L
70  REM CONVERT TO GALLONS
80 G = L * .2642
90  REM OUTFUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)L;" LITERS = "
     ;G;" GALLONS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "FAHRENHIET TO CELSIUS". This program will read in a temperature in fahrenhiet, convert it to celsius, and output the convertion. Say it is 76 degrees outside and you want to know how many degrees celsius it is. You could determine this by running this program and entering 76 as the temperature. The program will then convert 76 to celsius and output the convertion.

Here is a sample run and listing of the program.

```
RUN FAHRENHEIT TO CELSIUS



    ENTER THE TEMPERATURE IN FAHRENHEIT
DEGREES TO BE CONVERT TO CELSIUS?76



76 DEGREES FAHRENHEIT = 24.444 DEGREES
CELSIUS.



    A = ANOTHER   E = END

]LIST

10  REM CONVERT FAHRENHEIT
15  REM TO CELSIUS.
20  REM
30  REM INPUT TEMPERATURE
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE TEMP
     ERATURE IN FAHRENHEIT"
60  PRINT "DEGREES TO BE CONVERT
     TO CELSIUS";: INPUT F
70  REM CONVERT
80 C = 5 * (F - 32) / 9
85 C =  INT (C * 1000 + .5) / 100
     0
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT F;" DEGREES FAHRENHEIT
      = ";C;" DEGREES"
115  PRINT "CELSIUS."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

the next program is "CELSIUS TO FAHRENHIET". This program will read in the temperature in celsius, convert it to fahrenhiet, and output the convertion. An example would be if you have a reading of 24 degrees off a cemical and wanted to know what the temperature of the cemical in fahrenhiet is. You could run this program, enter 24, and the program would output the convertion.

Here is a sample run and listing of the program.

```
RUN CELSIUS TO FAHRENHEIT



    ENTER THE TEMPERATURE IN CELSIUS TO
BE CONVERTED TO FAHRENHEIT?24



    24 DEGREES CELSIUS = 75.2 DEGREES
FAHRENHEIT.



    A = ANOTHER    E = END

]LIST

10  REM CONVERT CELSIUS TO
15  REM FAHRENHEIT.
20  REM
30  REM INPUT TEMPERATURE
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"ENTER THE TEMP
     ERATURE IN CELSIUS TO"
60  PRINT "BE CONVERTED TO FAHREN
     HEIT";: INPUT C
70  REM CONVERT
80 F = (C * 9) / 5 + 32
90  REM OUTPUT CONVERTION
100  PRINT : PRINT : PRINT
110  PRINT  TAB( 5)C;" DEGREES CE
     LSIUS = ";F;" DEGREES"
115  PRINT "FAHRENHEIT."
120  PRINT : PRINT : PRINT
130  PRINT  TAB( 5)"A = ANOTHER
      E = END"
140  GET A$
150  IF A$ = "A" GOTO 40
160  END

]
```

The next program is "CONVERTIONS". This program will do one of six things and return to the beginning of the program or you can tell it to stop running. The six things are convertions. The convertions or from inches to centimeters, centimeters to inches, feet to meters, meters to feet, yards to meters, and meters to yards.

This program is the culmination of the previous convertion programs. It is written by putting the other programs together in one program. It is controlled by a main menue. The way to use this program is to press the number of the convertion you want. When you do this the program will automaticlly go to the section of code that does that particular convertion.

A note to go with this program is that you can easily expaned it by adding other programs from the collection to this one, and increasing the menue. the parts of this program that do the convertions start at line 1000, and each convertion is 100 lines from the starting point of the one before it. this was done to make it easyer to add to this program.

An exanple of the use of this program would be if you wanted to know how many inches are in 10 centimeters, and how many feet are in 10 meters, and how many meters are in 10 yards. To determine these three convertions You could run the program and first press "2", to convert from cm to inches. Then you would enter 10 for the number of centimeters. The program would output the number of inches and then ask you to "PRESS <RETURN> TO CONTINUE.". When you do press <return> the convertion will disappear, so it might not be a bad idea to write the convertions down on a sheet of paper. Next you would want to press 4, to convert meters to feet. Then you would enter 10 for the number of meters and the program would output the convertion to feet. Press <return> and now you are ready to convert yards to meters, so press 5. Next you will enter 10 for the number of yards. The program will output the number of meters and ask you to press <return>; do it. You would then be ready to stop so press 7 for exit to basic and you are through.

Here then is a sample run and a listing of the program.

```
RUN CONVERSIONS
         MAIN MENUE
    1 = INCHES TO CM
    2 = CM TO INCHES
    3 = FEET TO METERS
    4 = METERS TO FEET
    5 = YARDS TO METERS
    6 = METERS TO YARDS
    7 = EXIT TO BASIC

    ENTER THE NUMBER OF CM TO BE
CONVERTED TO INCHES, IN DECIMAL FORM?10

    10 CENTIMETERS = 3.93700788 INCHES.

    PRESS <RETURN> TO CONTINUE?

         MAIN MENUE

    1 = INCHES TO CM
    2 = CM TO INCHES
    3 = FEET TO METERS
    4 = METERS TO FEET
    5 = YARDS TO METERS
    6 = METERS TO YARDS
    7 = EXIT TO BASIC


    ENTER THE NUMBER OF METERS TO BE
CONVERTED TO FEET, IN DECIMAL FORM?10


    10 METERS = 32.81 FEET.


    PRESS <RETURN> TO CONTINUE?


         MAIN MENUE

    1 = INCHES TO CM
    2 = CM TO INCHES
    3 = FEET TO METERS
    4 = METERS TO FEET
    5 = YARDS TO METERS
    6 = METERS TO YARDS
    7 = EXIT TO BASIC
    ENTER THE NUMBER OF YARDS TO BE
CONVERTED TO METERS, IN DECIMAL FORM?10

     10 YARDS = 9.144 METERS.
     PRESS <RETURN> TO CONTINUE?
          MAIN MENUE

     1 = INCHES TO CM
     2 = CM TO INCHES
     3 = FEET TO METERS
     4 = METERS TO FEET
     5 = YARDS TO METERS
     6 = METERS TO YARDS
     7 = EXIT TO BASIC

]LIST

10  REM CONVERT INCHES-CM OR
11  REM FEET-METERS OR
12  REM YARDS-METERS
20  REM
30  REM PRINT MENUE
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 10)"MAIN MENUE"
60  PRINT
70  PRINT  TAB( 5)"1 = INCHES TO
     CM"
80  PRINT  TAB( 5)"2 = CM TO INCH
     ES"
90  PRINT  TAB( 5)"3 = FEET TO ME
     TERS"
100  PRINT  TAB( 5)"4 = METERS TO
      FEET"
110  PRINT  TAB( 5)"5 = YARDS TO
     METERS"
120  PRINT  TAB( 5)"6 = METERS TO
      YARDS"
130  PRINT  TAB( 5)"7 = EXIT TO B
     ASIC"
140  GET A
150  IF A < 1 OR A > 7 THEN  PRINT
     : PRINT : PRINT  TAB( 5)"ILL
     EGAL ENTRY. TRY AGAIN.": PRINT
     : PRINT : PRINT : GOTO 50
160  IF A = 1 GOTO 1100
170  IF A = 2 GOTO 1200
180  IF A = 3 GOTO 1300
190  IF A = 4 GOTO 1400
200  IF A = 5 GOTO 1500
210  IF A = 6 GOTO 1600
220  IF A = 7 GOTO 1700
1100  REM CONVERT INCHES TO CM
1101  REM
1102  REM INPUT THE # OF INCHES
1105  HOME : PRINT : PRINT : PRINT
```

```
1110  PRINT  TAB( 5)"ENTER THE NU
     MBER OF INCHES TO BE"
1120  PRINT "CONVERTED TO CM, IN
     DECIMAL FORM";: INPUT I
1130  REM CONVERT TO CENTIMETERS
1140 C = I * 2.54
1150  REM OUTPUT THE CONVERTION
1160  PRINT : PRINT : PRINT
1170  PRINT  TAB( 5)I;" INCHES =
     ";C;" CENTIMETERS."
1180  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"PRESS <RETURN> TO C
     ONTINUE";: INPUT A$
1190  GOTO 40
1200  REM CONVERT CM TO INCHES
1201  REM
1202  REM INPUT THE # OF CM
1205  HOME : PRINT : PRINT : PRINT

1210  PRINT  TAB( 5)"ENTER THE NU
     MBER OF CM TO BE"
1220  PRINT "CONVERTED TO INCHES,
      IN DECIMAL FORM";: INPUT C
1230  REM CONVERT TO INCHES
1240 I = C / 2.54
1250  REM  OUTPUT THE CONVERTION
1260  PRINT : PRINT : PRINT
1270  PRINT  TAB( 5)C;" CENTIMETE
     RS = ";I;" INCHES."
1280  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"PRESS <RETURN> TO C
     ONTINUE";: INPUT A$
1290  GOTO 40
1300  REM **FEET TO METERS**
1301  REM
1302  REM INPUT THE # OF FEET
1303  HOME : PRINT : PRINT : PRINT

1310  PRINT  TAB( 5)"ENTER THE NU
     MBER OF FEET TO BE"
1320  PRINT "CONVERTED TO METERS,
      IN DECIMAL FORM";: INPUT F
1330  REM CONVERT TO METERS
1340 M = F * .3048
1350  REM OUTPUT THE CONVERTION
1360  PRINT : PRINT : PRINT

1680  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"PRESS <RETURN> TO C
     ONTINUE";: INPUT A$
1690  GOTO 40
1700  END

]
```

```
1370  PRINT  TAB( 5)F;" FEET = ";
     M;" METERS."
1380  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"PRESS <RETURN> TO C
     ONTINUE";: INPUT A$
1390  GOTO 40
1400  REM **METERS TO FEET**
1401  REM
1402  REM INPUT THE # OF METERS
1405  HOME : PRINT : PRINT : PRINT

1410  PRINT  TAB( 5)"ENTER THE NU
     MBER OF METERS TO BE"
1420  PRINT "CONVERTED TO FEET, I
     N DECIMAL FORM";: INPUT M
1430  REM CONVERT TO FEET
1440 F = M * 3.281
1450  REM OUTPUT THE CONVERTION
1460  PRINT : PRINT : PRINT
1470  PRINT  TAB( 5)M;" METERS =
     ";F;" FEET."
1480  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"PRESS <RETURN> TO C
     ONTINUE";: INPUT A$
1490  GOTO 40
1500  REM **YARDS TO METERS**
1501  REM
1502  REM INPUT THE # OF YARDS
1505  HOME : PRINT : PRINT : PRINT

1510  PRINT  TAB( 5)"ENTER THE NU
     MBER OF YARDS TO BE"
1520  PRINT "CONVERTED TO METERS,
      IN DECIMAL FORM";: INPUT Y
1530  REM CONVERT TO METERS
1540 M = Y * .9144
1550  REM OUTPUT THE CONVERTION
1560  PRINT : PRINT : PRINT
1570  PRINT  TAB( 5)Y;" YARDS = "
     ;M;" METERS."
1580  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"PRESS <RETURN> TO C
     ONTINUE";: INPUT A$
1590  GOTO 40
1600  REM **METERS TO YARDS**
1601  REM
1602  REM INPUT THE # OF METERS
1605  HOME : PRINT : PRINT : PRINT

1610  PRINT  TAB( 5)"ENTER THE NU
     MBER OF METERS TO BE"
1620  PRINT "CONVERTED TO YARDS,
     IN DECIMAL FORM";: INPUT M
1630  REM CONVERT TO YARDS
1640 Y = M * 1.094
1650  REM OUTPUT CONVERTION
1660  PRINT : PRINT : PRINT
1670  PRINT  TAB( 5)M;" METERS =
     ";Y;" YARDS."
```

The next program is "BOARD CONVERT". This program converts board feet to cubic centimeters. This program is here as a kind of footnote to the convertion package. It is meant to demonstrate a method of using convertions in applications programs. An application program is any program that was concieved and written to be applyied, or used, in preforming a given task.

This program will ask you how many inches thick the board is. Then it will ask how many feet wide the board is. Finally it will ask how many feet long the board is. The program will multiply these three input numbers, then convert the product to centimeters and output the convertion. An example would be to determine the cubic centimeters in a 2 by 12. To do this you would run the program, input 2.75 for the thickness, 2 for the width, and 12 for the length. The program would then output the number of cubic centimeters.

Here is a sample run and listing of the program.

```
RUN BOARD CONVERT


        ***BOARD CONVERT***

        DETERMINING BOARD FEET KNOWING  THICKNESS, WIDTH, AND LENGTH.



    HOW MANY INCHES THICK IS THE BOARD?2.75


    HOW MANY FEET WIDE IS IT?2


    HOW MANY FEET LONG IS THE BOARD?12


    THE VOLUME OF ONE BOARD IS 167.64
 CUBED CENTIMETERS.
```

```
]LIST

10  REM    THIS PROGRAM IS
20  REM DESIGNED TO GET THE I.A.
25  REM STUDENT USE TO USING THE
30  REM COMPUTER TO AID HIM OR
40  REM HER IN DOING HIS OR HER
50  REM PROJECTS.
60  REM
70  REM  THIS PROGRAM WILL
71  REM CONVERT BOARD FEET
80  REM TO BOARD CENTIMETERS.
205  REM
206  REM
207  HOME : PRINT : PRINT : PRINT

210  PRINT  TAB( 9)"***BOARD CONV
     ERT***": PRINT
220  PRINT  TAB( 9)"DETERMINING B
     OARD FEET KNOWING  THICKNESS
     , WIDTH, AND LENGTH."
230  PRINT : PRINT : PRINT : PRINT

250  PRINT  TAB( 5)"HOW MANY INCH
     ES THICK IS THE BOARD";: INPUT
     T
251  REM
252  REM CONVERT INCHES THICK
253  REM TO FEET.
254  REM
255 T = T / 12
260  PRINT : PRINT : PRINT
270  PRINT  TAB( 5)"HOW MANY FEET
      WIDE IS IT";: INPUT W: PRINT
     : PRINT : PRINT
280  PRINT  TAB( 5)"HOW MANY FEET
      LONG IS THE BOARD";: INPUT
     L: PRINT : PRINT : PRINT
290 B = T * W * L
291  REM
292  REM COVERT CUBED FEET TO
293  REM CUBED CENTIMETERS.
294  REM
295 C = B * 30.48
300  PRINT  TAB( 5)"THE VOLUME OF
      ONE BOARD IS ";C
310  PRINT " CUBED CENTIMETERS."

]
```

The second program in the graphics group is "VIEW OBJECT". This program allows you to view any object defined by "DEFINE OBJECT". using this program you can view the object from any angle and at any distance, hut all projections will be prespective, and all lines will be visible. "VIEW OBJECT" can be run independently or by the program "DEFINE OBJECT".

This program contains a subroutine called "Clip". Clip finds all the lines that would cause the program to try to plot off the screen and clips them to the screen's edge. If the line is entirely off the screen clip tells the program to skip plotting the line altogether. This is important because if the program should try to plot off the screen it would give an error message and stop running.

Here is a sample run and listing of the program.

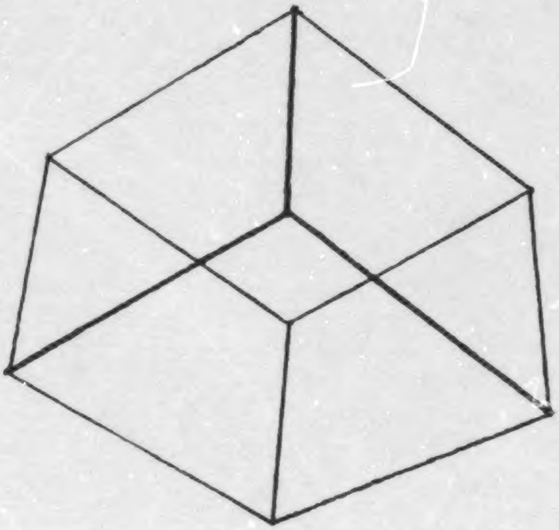
```
]RUN VIEW OBJECT
WHAT FILE DID YOU PUT THE OBJECT IN?CUBE



WHAT SIZE WINDOW DO YOU WANT?
PICK A SIZE LARGER THAN THE OBJECTS
LARGEST MEASUREMENT?20



WHAT ANGLE OFF THE X-AXIS DO YOU WANT
VIEW THE OBJECT FROM?45
WHAT ANGLE OFF THE Z-AXIS DO YOU WANT
TO VIEW THE OBJECT FROM ?135
PRESS ANY KEY TO CONTINUE?
```



```
DO YOU WISH TO:
         C. CHANGE VIEW
         E. EXIT PROGRAM
```

```
]LIST

540  DIM V(40,3),E(40,2),S(10,10)

541  PRINT "WHAT FILE DID YOU PUT
      THE OBJECT IN";: INPUT N$
542 D$ =  CHR$ (4)
543  HCOLOR= 3
544  PRINT D$;"OPEN";N$
545  PRINT D$;"READ ";N$
546  FOR I = 1 TO 40: INPUT V(I,1
     ): INPUT V(I,2): INPUT V(I,3
     ): NEXT I
547  FOR I = 1 TO 40: INPUT E(I,1
     ): INPUT E(I,2): NEXT I
548  FOR I = 1 TO 10: FOR J = 1 TO
     10: INPUT S(I,J): NEXT J: NEXT
     I
549  PRINT D$;"CLOSE";N$
570  PRINT : PRINT : PRINT
620 D = 279:R = 279:L = 0:T = 0:B
      = 191:SC = 280 / 192
625  PRINT "WHAT SIZE WINDOW DO Y
     OU WANT?"
630  PRINT "PICK A SIZE LARGER TH
     AN THE OBJECTS"
640  PRINT "LARGEST MEASUREMENT";

650  INPUT RH
660  PRINT : PRINT : PRINT
670  PRINT "WHAT ANGLE OFF THE X-
     AXIS DO YOU WANT"
680  PRINT "VIEW THE OBJECT FROM"
     ;: INPUT TH
682  IF TH < 360 GOTO 690
684 TH = TH - 360
686  GOTO 682
690 TH = TH * 3.141592654 / 180
700  PRINT "WHAT ANGLE OFF THE Z-
     AXIS DO YOU WANT"
710  PRINT "TO VIEW THE OBJECT FR
     OM ";: INPUT PH
712  IF PH < 360 GOTO 720
714 PH = PH - 360
716  GOTO 712
720 PH = PH * 3.141592654 / 180
```

```
725  HGR
730 S1 =  SIN (TH)
740 S2 =  SIN (PH)
750 C1 =  COS (TH)
760 C2 =  COS (PH)
770 I = 1
780  IF E(I,1) = 0 GOTO 990
785 RE = 0
790 X = V(E(I,1),1)
800 Y = V(E(I,1),2)
810 Z = V(E(I,1),3)
820 X1 =  - X * S1 + Y * C1
830 Y1 =  - X * C1 * C2 - Y * S1 *
     C2 + Z * S2
840 Z1 =  - X * S2 * C1 - Y * S2 *
     S1 - Z * C2 + RH
850 XF = D * (X1 / Z1) * SC + 140

860 YF = 96 - D * (Y1 / Z1)
870 X = V(E(I,2),1)
880 Y = V(E(I,2),2)
890 Z = V(E(I,2),3)
900 X2 =  - X * S1 + Y * C1
910 Y2 =  - X * C1 * C2 - Y * S1 *
     C2 + Z * S2
920 Z2 =  - X * S2 * C1 - Y * S2 *
     S1 - Z * C2 + RH
930 XT = D * (X2 / Z2) * SC + 140

940 YT = 96 - D * (Y2 / Z2)
950  GOSUB 1100
955  IF RE = 1 GOTO 970
960  HPLOT XF,YF TO XT,YT
970 I = I + 1
980  GOTO 780
990  PRINT "PRESS ANY KEY TO CONT
     INUE?": GET A$
1000  TEXT
1010  PRINT "DO YOU WISH TO:"
1020  PRINT  TAB( 10)"C. CHANGE V
     IEW"
1030  PRINT  TAB( 10)"E. EXIT PRO
     GRAM"
1040  GET A$: PRINT : PRINT : PRINT

1050  IF A$ = "C" GOTO 625
1060  IF A$ = "E" GOTO 1090
1070  PRINT "ILLEGAL ENTRY, TRY A
     GAIN.": PRINT : PRINT : PRINT

1080  GOTO 1010
1090  END
1092  REM  THIS IS A
```

```
1093  REM ROUTINE TO CLIP
1094  REM LINES BEING
1095  REM DRAWN TO THE
1096  REM SCREEN.
1097  REM
1100 L1 = 0:R1 = 0:T1 = 0:B1 = 0:
     L2 = 0:R2 = 0:T2 = 0:B2 = 0
1101  REM VARIABLES: L-LEFT
1102  REM R-RIGHT, T-TOP,
1103  REM B-BOTTOM. VARIA-
1104  REM BLES LIKE L1 CLIP
1105  REM THE FIRST POINT
1106  REM AND LIKE L2 CLIP
1107  REM THE SECOND.
1108  REM
1109  REM CLIP 1ST TO LEFT
1110  IF XF >  = L GOTO 1130
1120 L1 = 1
1124  REM
1125  REM CLIP 1ST TO RIGHT
1126  REM
1130  IF XF <  = R THEN 1150
1140 R1 = 1
1144  REM
1145  REM CLIP 1ST TO TOP
1146  REM
1150  IF YF >  = T THEN 1170
1160 T1 = 1
1164  REM
1165  REM CLIP 1ST TO BOTTOM
1166  REM
1170  IF YF <  = B THEN 1190
1180 B1 = 1
1188  REM
1189  REM CLIP 2ND TO LEFT
1190  IF XT >  = L THEN 1210
1200 L2 = 1
1208  REM
1209  REM CLIP 2ND TO RIGHT
1210  IF XT <  = R THEN 1230
1220 R2 = 1
1228  REM
1229  REM CLIP 2ND TO TOP
1230  IF YT >  = T THEN 1250
1240 T2 = 1
1248  REM
1249  REM CLIP 2ND TO BOTTOM
1250  IF YT <  = B THEN 1270
1260 B2 = 1
1261  REM
1262  REM ACCEPT LINE IF
1263  REM BOTH POINTS ARE
1264  REM WITHIN THE
```

```
1265  REM BOUNDERY.
1266  REM
1270  IF L1 <  > 0 OR L2 <  > 0 OR
     R1 <  > 0 OR R2 <  > 0 GOTO
     1290
1280  IF T1 = 0 AND T2 = 0 AND B1
      = 0 AND B2 = 0 THEN  RETURN

1281  REM
1282  REM IF RE=1 REJECT LINE
1290  IF L1 <  > 0 AND L2 <  > 0 THEN
     RE = 1
1291  IF R1 <  > 0 AND R2 <  > 0 THEN
     RE = 1
1293  IF T1 <  > 0 AND T2 <  > 0 THEN
     RE = 1
1294  IF B1 <  > 0 AND B2 <  > 0 THEN
     RE = 1
1300  IF RE = 1 THEN  RETURN
1301  REM
1302  REM THIS SECTION FINDS
1303  REM THE INTERSECTION OF
1304  REM THE LINE AND ONE OF
1305  REM BOUNDS, THEN SENDS
1306  REM THE LINE BACK
1307  REM THROUGH THE
1308  REM SUBROUTINE.
1309  REM  INTER. 1ST TO LEFT
1310  IF L1 <  > 1 GOTO 1350
1320 YF = YF + (YT - YF) * (L - X
     F) / (XT - XF)
1330 XF = L
1340  GOTO 1100
1344  REM
1345  REM INTER. 1ST WITH RIGHT
1346  REM
1350  IF R1 <  > 1 GOTO 1390
1360 YF = YF + (YT - YF) * (R - Y
     F) / (XT - XF)
1370 XF = R
1380  GOTO 1100
1384  REM
1385  REM 1ST WITH TOP
1386  REM
1390  IF T1 <  > 1 GOTO 1430
1400 XF = XF + (XT - XF) * (T - Y
     F) / (YT - YF)
1410 YF = T
1420  GOTO 1100
1424  REM
1425  REM 1ST WITH BOTTOM
1426  REM
1430  IF B1 <  > 1 GOTO 1470
```

```
1440 XF = XF + (XT - XF) * (B - Y
     F) / (YT - YF)
1450 YF = B
1460  GOTO 1100
1464  REM
1465  REM 2ND WITH LEFT
1466  REM
1470  IF L2 <  > 1 GOTO 1510
1480 YT = YF + (YT - YF) * (L - X
     F) / (XT - XF)
1490 XT = L
1500  GOTO 1100
1504  REM
1505  REM 2ND WITH RIGHT
1506  REM
1510  IF R2 <  > 1 GOTO 1550
1520 YT = YF + (YT - YF) * (R - X
     F) / (XT - XF)
1530 XT = R
1540  GOTO 1100
1544  REM
1545  REM 2ND WITH TOP
1546  REM
1550  IF T2 <  > 1 GOTO 1590
1560 XT = XF + (XT - XF) * (T - Y
     F) / (YT - YF)
1570 YT = T
1580  GOTO 1100
1584  REM
1585  REM 2ND WITH BOTTOM
1586  REM
1590  IF B2 <  > 1 GOTO 1100
1600 XT = XF + (XT - XF) * (B - Y
     F) / (YT - YF)
1610 YT = B
1620  GOTO 1100
1883  REM REJECT IF BOTH
1884  REM POINTS ARE OUTSIDE
1885  REM OF BOUNDERY.
1886  REM

]
```

GRAPHICS

This set of programs deals with Three-Dimensional Graphics. The first program of the group is "DEFINE OBJECT". This program defines an object in 3-D to be viewed by another program, called "VIEWS". The objects created by "DEFINE OBJECT" can be viewed by the program "VIEW OBJECT", but "VIEW OBJECT" does not remove hidden lines, nor does it center the object, or allow for parallel projections.

"DEFINE OBJECT" works on the basis of a three coordinant system. They are the X, Y, and Z-coordinants. To use this program you must have the object defined in this type of coordinant system.

To run this program you need to know the number of sides the object has, the number of corners it has, the coordinants of each corner, and what corners are in what sides. You must also be able to enter the corners that make up the sides in counterclockwise order as they appear while viewing the side from outside the object.

IMPORTANT NOTE FOR ALL GRAPHICS PROGRAMS: Somtimes when you turn on the graphics page it will delete part of your basic program. To avoid this run the program "ALLOCATE" which moves your basic program to a different location in memory, thus getting it out of the way of the graphics page. This will only be necessary for long graphics programs.

After "DEFINE OBJECT" has run it will ask you if you want to view the object. If you enter Y then "DEFINE OBJECT" will run the program "VIEW OBJECT".

Here then is a sample run and listing of "DEFINE OBJECT".

```
RUN   DEFINE OBJECT


     THIS PROGRAM LETS YOU DEFINE AN
OBJECT IN 3-D.
           DEMONSTRATION PROGRAM
          FOR EDUCATIONAL USE ONLY



     PRESS <RETURN> TO CONTINUE?



     TO RUN THIS PROGRAM YOU MUST KNOW
THE NUMBER OF SIDES AND THE NUMBER
OF CORNERS. YOU MUST ALSO BE ABLE TO
SAY WHICH CORNERS COMPRISE WHICH
SIDES.

     YOU WILL NEED TO BE ABLE TO GIVE
THE CORNERS IN COUNTERCLOCKWISE ORDER
AS THEY APPEAR WHEN OBSERVED FROM
FROM OUTSIDE THE OBJECT.


     DO YOU HAVE THIS INFORMATION (Y/N)?


ENTER THE NUMBER OF SIDES?6
ENTER THE NUMBER OF CORNERS?8




ENTER THE X-COORDINANT OF CORNER 1 ?0
ENTER THE Y-COORDINANT OF CORNER 1 ?0
ENTER THE Z-COORDINANT OF CORNER 1 ?0

ENTER THE X-COORDINANT OF CORNER 2 ?4
ENTER THE Y-COORDINANT OF CORNER 2 ?0
ENTER THE Z-COORDINANT OF CORNER 2 ?0

ENTER THE X-COORDINANT OF CORNER 3 ?4
ENTER THE Y-COORDINANT OF CORNER 3 ?4
ENTER THE Z-COORDINANT OF CORNER 3 ?0

ENTER THE X-COORDINANT OF CORNER 4 ?0
ENTER THE Y-COORDINANT OF CORNER 4 ?4
ENTER THE Z-COORDINANT OF CORNER 4 ?0

ENTER THE X-COORDINANT OF CORNER 5 ?0
ENTER THE Y-COORDINANT OF CORNER 5 ?0
ENTER THE Z-COORDINANT OF CORNER 5 ?-4

ENTER THE X-COORDINANT OF CORNER 6 ?4
ENTER THE Y-COORDINANT OF CORNER 6 ?0
ENTER THE Z-COORDINANT OF CORNER 6 ?-4

ENTER THE X-COORDINANT OF CORNER 7 ?4
ENTER THE Y-COORDINANT OF CORNER 7 ?4
ENTER THE Z-COORDINANT OF CORNER 7 ?-4

ENTER THE X-COORDINANT OF CORNER 8 ?0
ENTER THE Y-COORDINANT OF CORNER 8 ?4
ENTER THE Z-COORDINANT OF CORNER 8 ?-4


HOW MANY CORNERS ARE IN SIDE 1 ?4


ENTER THE CORNERS OF SIDE 1.
BE SURE TO ENTER THE CORNERS IN
COUNTERCLOCKWISE ORDER, AS THEY APPEAR
WHILE VIEWING THE OBJECT FROM THE
OUTSIDE.


ENTER THE NUMBER OF CORNER 1 OF
SIDE 1 ?1
ENTER THE NUMBER OF CORNER 2 OF
SIDE 1 ?2
ENTER THE NUMBER OF CORNER 3 OF
SIDE 1 ?3
ENTER THE NUMBER OF CORNER 4 OF
SIDE 1 ?4

HOW MANY CORNERS ARE IN SIDE 2 ?4


ENTER THE CORNERS OF SIDE 2.
BE SURE TO ENTER THE CORNERS IN
COUNTERCLOCKWISE ORDER, AS THEY APPEAR
WHILE VIEWING THE OBJECT FROM THE
OUTSIDE.


ENTER THE NUMBER OF CORNER 1 OF
SIDE 2 ?8
ENTER THE NUMBER OF CORNER 2 OF
SIDE 2 ?7
ENTER THE NUMBER OF CORNER 3 OF
```

```
SIDE 2 ?6
ENTER THE NUMBER OF CORNER 4 OF
SIDE 2 ?5


HOW MANY CORNERS ARE IN SIDE 3 ?4



ENTER THE CORNERS OF SIDE 3.
BE SURE TO ENTER THE CORNERS IN
COUNTERCLOCKWISE ORDER, AS THEY APPEAR
WHILE VIEWING THE OBJECT FROM THE
OUTSIDE.


ENTER THE NUMBER OF CORNER 1 OF
SIDE 3 ?2
ENTER THE NUMBER OF CORNER 2 OF
SIDE 3 ?6
ENTER THE NUMBER OF CORNER 3 OF
SIDE 3 ?7
ENTER THE NUMBER OF CORNER 4 OF
SIDE 3 ?3


HOW MANY CORNERS ARE IN SIDE 4 ?4



ENTER THE CORNERS OF SIDE 4.
BE SURE TO ENTER THE CORNERS IN
COUNTERCLOCKWISE ORDER, AS THEY APPEAR
WHILE VIEWING THE OBJECT FROM THE
OUTSIDE.


ENTER THE NUMBER OF CORNER 1 OF
SIDE 4 ?5
ENTER THE NUMBER OF CORNER 2 OF
SIDE 4 ?1
ENTER THE NUMBER OF CORNER 3 OF
SIDE 4 ?4
ENTER THE NUMBER OF CORNER 4 OF
SIDE 4 ?8


HOW MANY CORNERS ARE IN SIDE 5 ?4



ENTER THE CORNERS OF SIDE 5.
BE SURE TO ENTER THE CORNERS IN
```

```
COUNTERCLOCKWISE ORDER, AS THEY APPEAR
WHILE VIEWING THE OBJECT FROM THE
OUTSIDE.


ENTER THE NUMBER OF CORNER 1 OF
SIDE 5 ?4
ENTER THE NUMBER OF CORNER 2 OF
SIDE 5 ?3
ENTER THE NUMBER OF CORNER 3 OF
SIDE 5 ?7
ENTER THE NUMBER OF CORNER 4 OF
SIDE 5 ?8


HOW MANY CORNERS ARE IN SIDE 6 ?4



ENTER THE CORNERS OF SIDE 6.
BE SURE TO ENTER THE CORNERS IN
COUNTERCLOCKWISE ORDER, AS THEY APPEAR
WHILE VIEWING THE OBJECT FROM THE
OUTSIDE.


ENTER THE NUMBER OF CORNER 1 OF
SIDE 6 ?5
ENTER THE NUMBER OF CORNER 2 OF
SIDE 6 ?6
ENTER THE NUMBER OF CORNER 3 OF
SIDE 6 ?2
ENTER THE NUMBER OF CORNER 4 OF
SIDE 6 ?1


WHAT FILE DO YOU WANT THE OBJECT
SAVED IN?CUBE



THIS PROGRAM WILL ALSO ALLOW YOU TO
VIEW THE OBJECT. DO YOU WANT TO VIEW
THE OBJECT (Y/N)?



]LIST

2  REM THIS IS A PROGRAM TO
4  REM DEFINE AN OBJECT IN
6  REM THREE DIMENSIONS.
8  REM
```

```
10  REM THIS PROGRAM WILL
12  REM HAVE THE USER
14  REM ENTER THE NUMBER OF
16  REM SIDES AND THEN
18  REM ENTER THE NUMBER
20  REM OF CORNERS. THEN
22  REM THE PROGRAM HAS THE
24  REM USER SPECIFY WHERE
26  REM THE CONERS ARE.
28  REM THE PROGRAM THEN
30  REM ASK WHAT CORNERS
32  REM ARE IN WHAT
34  REM SIDES. THE
36  REM PROGRAM STORES
38  REM SIDES AS EDGES
40  REM AND THE EDGES
42  REM ARE SAVED AS
44  REM CORNERS.
46  REM
48  REM THE DATA CREATED
50  REM BY THIS PROGRAM
52  REM IS STORED IN A FILE
54  REM TO BE VIEWED BY
56  REM THE PROGRAM "VIEWS".
58  REM
60  REM THIS PROGRAM ALSO ALLOWS
62  REM THE USER TO VIEW THE
64  REM OBJECT, BUT WITHOUT
66  REM THE HIDDEN-LINES
68  REM REMOVED.
70  REM
75  DIM V(40,3),E(40,2),S(10,10)
78  REM
79  HOME : PRINT : PRINT : PRINT

80  PRINT  TAB( 5)"THIS PROGRAM L
     ETS YOU DEFINE AN"
90  PRINT "OBJECT IN 3-D."
91  VTAB 10
92  INVERSE
93  HTAB 10: PRINT "DEMONSTRATION
      PROGRAM"
94  HTAB 9: PRINT "FOR EDUCATIONA
     L USE ONLY"
95  NORMAL
96  PRINT : PRINT : PRINT
97  PRINT  TAB( 5)"PRESS <RETURN>
      TO CONTINUE";: INPUT A$
98  HOME : PRINT : PRINT : PRINT

100  PRINT  TAB( 5)"TO RUN THIS P
     ROGRAM YOU MUST KNOW"
110  PRINT "THE NUMBER OF SIDES A
```

```
    ND THE NUMBER"
120 PRINT "OF CORNERS. YOU MUST
    ALSO BE ABLE TO"
130 PRINT "SAY WHICH CORNERS COM
    PRISE WHICH"
140 PRINT "SIDES."
150 PRINT
160 PRINT  TAB( 5)"YOU WILL NEED
     TO BE ABLE TO GIVE"
170 PRINT "THE CORNERS IN COUNTE
    RCLOCKWISE ORDER"
180 PRINT "AS THEY APPEAR WHEN O
    BSERVED FROM"
190 PRINT "FROM OUTSIDE THE OBJE
    CT.": PRINT : PRINT
200 PRINT  TAB( 5)"DO YOU HAVE T
    HIS INFORMATION (Y/N)?";
205 GET A$: PRINT : PRINT : PRINT

210 IF A$ = "N" GOTO 620
220 IF A$ = "Y" GOTO 240
230 PRINT  TAB( 5)"ILLEGAL ENTRY
    , TRY AGAIN.": PRINT : PRINT
    : PRINT : GOTO 200
240 PRINT "ENTER THE NUMBER OF S
    IDES";
250 INPUT NS
260 PRINT "ENTER THE NUMBER OF C
    ORNERS";
270 INPUT NV
275 PRINT : PRINT : PRINT
280 FOR I = 1 TO NV
290 PRINT "ENTER THE X-COORDINAN
    T OF CORNER ";I;" ";
300 INPUT V(I,1)
310 PRINT "ENTER THE Y-COORDINAN
    T OF CORNER ";I;" ";
320 INPUT V(I,2)
330 PRINT "ENTER THE Z-COORDINAN
    T OF CORNER ";I;" ";
340 INPUT V(I,3)
345 PRINT
350 NEXT I
355 K = 0
360 FOR I = 1 TO NS
370 PRINT : PRINT : PRINT "HOW M
    ANY CORNERS ARE IN SIDE ";I;
    " ";
380 INPUT SV
385 PRINT : PRINT : PRINT
390 PRINT "ENTER THE CORNERS OF
    SIDE ";I;"."
400 PRINT "BE SURE TO ENTER THE
```

```
    CORNERS IN"
410  PRINT "COUNTERCLOCKWISE ORDE
     R, AS THEY APPEAR"
420  PRINT "WHILE VIEWING THE OBJ
     ECT FROM THE"
430  PRINT "OUTSIDE.": PRINT : PRINT

440  FOR J = 1 TO SV
450  PRINT "ENTER THE NUMBER OF C
     ORNER ";J;" OF"
460  PRINT "SIDE ";I;" ";: INPUT
     Q
470 E(K + J,1) = Q
475 S(I,J) = K + J
480  IF J = 1 GOTO 500
490 E(K + J - 1,2) = Q
500  IF J <  > SV GOTO 520
510 E(K + J,2) = E(K + 1,1)
520  NEXT J
530 K = K + SV
535  NEXT I
536 D$ =  CHR$ (4)
541  PRINT : PRINT : PRINT "WHAT
     FILE DO YOU WANT THE OBJECT"
     : PRINT "SAVED IN";: INPUT N
     $: PRINT : PRINT : PRINT
542  PRINT D$;"OPEN";N$: PRINT D$
     ;"CLOSE";N$
543  PRINT D$;"DELETE";N$
544  PRINT D$;"OPEN";N$
545  PRINT D$;"WRITE";N$
546  FOR I = 1 TO 40: PRINT V(I,1
     ): PRINT V(I,2): PRINT V(I,3
     ): NEXT I
547  FOR I = 1 TO 40: PRINT E(I,1
     ): PRINT E(I,2): NEXT I
548  FOR I = 1 TO 10: FOR J = 1 TO
     10: PRINT S(I,J): NEXT J: NEXT
     I
549  PRINT D$;"CLOSE";N$
550  PRINT "THIS PROGRAM WILL ALS
     O ALLOW YOU TO"
555  PRINT "VIEW THE OBJECT. DO Y
     OU WANT TO VIEW"
560  PRINT "THE OBJECT (Y/N)?";
570  GET A$: PRINT : PRINT : PRINT

580  IF A$ = "N" GOTO 620
590  IF A$ = "Y" GOTO 610
600  PRINT "ILLEGAL ENTRY, TRY AG
     AIN.": PRINT : PRINT : PRINT

610  PRINT D$;"RUN VIEW OBJECT"
620  END

]
```

The next program is "VIEWS". This program will allow you to view any object defined by "DEFINE OBJECT". It will allow you to use parallel projections, like front, top, and right side views. Or, you can use prespective projections. You can view the object from any angle and any distance. This program will allow you to move around to object any number of degrees and stoping along the way any number of times. Doing this is refered to as rotating about the object. This program will remove hidden lines. "VIEWS" also contains the subroutine Clip, as described in the section on "VIEW OBJECT". This progrm does not, however, run fast enough to do animation.

For example say you wanted to do a top, front, and right side projection of the object. For projection type you would use parallel. For scale you would use something large enough to make the object easily studied. For the top view set the angle off the x-axis at 90 and the off the z-axis at zero. Then for a front view rotate the x-axis 0 degrees and the z-axis 90 degrees. Finally for a right side view rotate x 90 degrees and z 0 degrees. Thus you have the three views.

Before running this program you must run allocate to allow for enough space. Here is a sample run and listing of the program.

The next program is "ALLOCATE". This program will move the starting address of any program in memory and the line counter to a new location. It will stay in effect until the machine is rebooted. This program should be run when a basic program is so large that the graphics page, or anything, causes it to bomb or be partially deleted. This program casues no echo to the screen so there is no sample run of it.

Here is a listing of the program.

```
LOAD ALLOCATE
]LIST

10  REM SOME OF THE GRAPHIC
20  REM PROGRAMS USE A LARGE
30  REM AMOUNT OF MEMORY, SO
40  REM IT MAY BE NECESSARY
50  REM TO RUN THIS PROGRAM
60  REM WHICH MOVES THE
70  REM PROGAM TO DIFFERENT
80  REM LOCATION IN MEMORY,
90  REM FOR THE GRAPHICS TO
100  REM WORK PROPERLY.
110  REM
120  REM THIS PROGRAM WILL
130  REM MOVE THE BASIC
140  REM PROGRAM THUS ALLOWING
150  REM THE SYSTEMS GRAPHICS
160  REM MORE SPACE.
170  REM
200  POKE 103,1
210  POKE 104,96
220  POKE 24576,0
230  END

]
```

```
]RUN ALLOCATE

]RUN VIEWS


    THIS IS A PROGRAM TO VIEW AN
OBJECT FROM SEVERAL D.IFFERENT ANGLES.
         DEMONSTRATION PROGRAM
        FOR EDUCATIONAL USE ONLY



    PRESS <RETURN> TO CONTINUE?



    WHAT FILE IS THE OBJECT IN?HOUSE



    THIS PROGRAM WILL ALLOW YOU TO
USE TWO TYPES OF PROJECTIONS,
PARALLEL AND PRESPECTIVE.
    WHICH WOULD YOU PREFER:
         A. PARALLEL
         B. PRESPECTIVE



    WHAT SCALE FACTOR DO YOU WANT?40






    HOW MANY DEGREES OFF THE X AXIS DO
YOU WANT THE STARTING VIEWPOINT?90
HOW MANY DEGREES OFF THE Z-AXIS?0
WAIT'FOR'IMAGE
STILL'PROCESSING
ONE'MOMENT'PLEASE
THERE IS ABSOLUTLY NO CAUSE FOR CONCERN
PRESS ANY KEY TO CONTINUE?



    DO YOU WANT TO
         R. ROTATE THE OBJECT
         A. ALTER PROJECTION TYPE
         E. EXIT PROGRAM
```

```
     HOW MANY DEGREES ALONG THE
X-AXIS DO YOU WANT IT ROTATED?0
HOW MANY DEGREES ALONG THE Z-AXIS?90
HOW MANY STEPS DO YOU WANT?1
WAIT`FOR`IMAGE
STILL`PROCESSING
ONE`MOMENT`PLEASE
THERE IS ABSOLUTLY NO CAUSE FOR CONCERN
PRESS ANY KEY TO CONTINUE?



     DO YOU WANT TO
            R. ROTATE THE OBJECT
            A. ALTER PROJECTION TYPE
            E. EXIT PROGRAM



     HOW MANY DEGREES ALONG THE
X-AXIS DO YOU WANT IT ROTATED?90
HOW MANY DEGREES ALONG THE Z-AXIS?0
HOW MANY STEPS DO YOU WANT?1
WAIT`FOR`IMAGE
STILL`PROCESSING
ONE`MOMENT`PLEASE
THERE IS ABSOLUTLY NO CAUSE FOR CONCERN
PRESS ANY KEY TO CONTINUE?



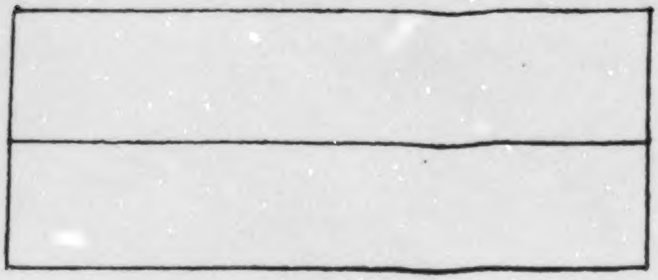
     DO YOU WANT TO
            R. ROTATE THE OBJECT
            A. ALTER PROJECTION TYPE
            E. EXIT PROGRAM

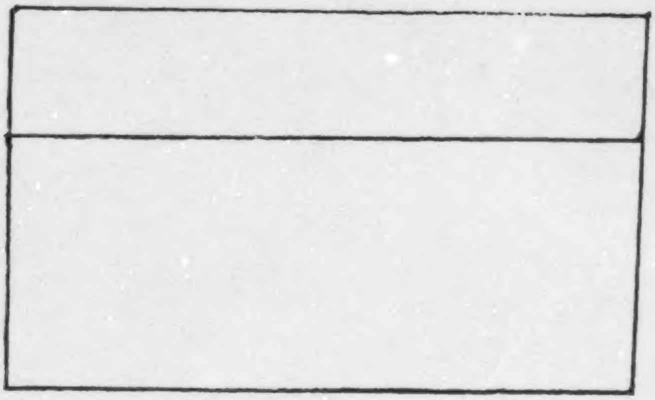
]LIST

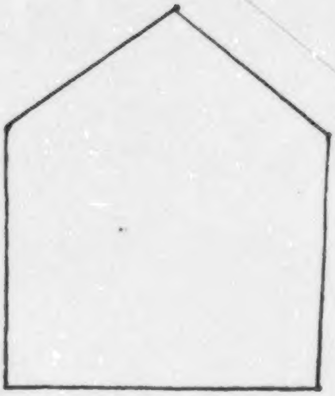
10  REM THIS PROGRAM WILL
12  REM ALLOW YOU TO VIEW
14  REM AN OBJECT FROM A
16  REM FILE CREATED BY THE
18  REM PROGRAM "DEFINE OBJECT".
20  REM
90  REM DIMENTION ARRAYS AND
92  REM SET VARIABLES.
100  DIM V(40,3),E(40,3),S(10,10)

110 D$ =  CHR$ (4)
120 L = 0:R = 279:T = 0:B = 191:S
```

```
]PR#0
```







```
     C = 280 / 192:D = 280
125  HCOLOR= 3
126  HOME : PRINT : PRINT : PRINT

130  PRINT  TAB( 5)"THIS IS A PRO
     GRAM TO VIEW AN"
140  PRINT "OBJECT FROM SEVERAL D
     IFFERENT ANGLES."
150  VTAB 10
151  INVERSE
152  HTAB 10: PRINT "DEMONSTRATIO
     N PROGRAM"
153  HTAB 9: PRINT "FOR EDUCATION
     AL USE ONLY"
154  NORMAL
155  PRINT : PRINT : PRINT
156  PRINT  TAB( 5)"PRESS <RETURN
     > TO CONTINUE";: INPUT A$
157  HOME : PRINT : PRINT : PRINT

160  PRINT  TAB( 5)"WHAT FILE IS
     THE OBJECT IN";: INPUT N$
170  PRINT D$;"OPEN";N$
180  PRINT D$;"READ";N$
190  FOR I = 1 TO 40
200  INPUT V(I,1)
210  INPUT V(I,2)
220  INPUT V(I,3)
230  NEXT I
240  FOR I = 1 TO 40
250  INPUT E(I,1)
260  INPUT E(I,2)
270 E(I,3) = 0
280  NEXT I
290  FOR I = 1 TO 10
300  FOR J = 1 TO 10
310  INPUT S(I,J)
320  NEXT J
330  NEXT I
340  PRINT D$;"CLOSE";N$
341  REM
342  REM FIND CENTER POINT
343  REM
350 P2 = V(1,2):Q2 = V(1,2)
360 P3 = V(1,3):Q3 = V(1,3)
370  FOR I = 2 TO 40
380  IF V(I,1) > P1 THEN P1 = V(I
     ,1)
390  IF V(I,1) < Q1 THEN Q1 = V(I
     ,1)
400  IF V(I,2) > P2 THEN P2 = V(I
     ,2)
410  IF V(I,2) < Q2 THEN Q2 = V(I
     ,2)
420  IF V(I,3) > P3 THEN P3 = V(I
     ,3)
430  IF V(I,3) < Q3 THEN Q3 = V(I
     ,3)
440  NEXT I
450 CX = P1 - Q1
455 CX = CX / 2
460 CX = P1 - CX
470 CY = P2 - Q2
475 CY = CY / 2
480 CY = P2 - CY
490 CZ = P3 - Q3
495 CZ = CZ / 2
500 CZ = P3 - CZ
505  REM
506  REM LOOP TO FIND A NORMAL
507  REM POINT ON EACH SIDE
508  REM
510 I = 1
520  IF S(I,1) = 0 GOTO 610
530 P1 = (V(E(S(I,1),2),1) - CX) -
     (V(E(S(I,1),1),1) - CX)
540 P2 = (V(E(S(I,1),2),2) - CY) -
     (V(E(S(I,1),1),2) - CY)
550 P3 = (V(E(S(I,1),2),3) - CZ) -
     (V(E(S(I,1),1),3) - CZ)
560 Q1 = (V(E(S(I,2),2),1) - CX) -
     (V(E(S(I,1),1),1) - CX)
570 Q2 = (V(E(S(I,2),2),2) - CY) -
     (V(E(S(I,1),1),2) - CY)
580 Q3 = (V(E(S(I,2),2),3) - CZ) -
     (V(E(S(I,1),1),3) - CZ)
581 N(I,1) = P2 * Q3 - Q2 * P3
582 N(I,2) = P3 * Q1 - Q3 * P1
583 N(I,3) = P1 * Q2 - Q1 * P2
590 I = I + 1
600  GOTO 520
605  REM
610  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"THIS PROGRAM WILL A
     LLOW YOU TO"
620  PRINT "USE TWO TYPES OF PROJ
     ECTIONS,"
630  PRINT "PARALLEL AND PRESPECT
     IVE."
640  PRINT  TAB( 5)"WHICH WOULD Y
     OU PREFER:"
650  PRINT  TAB( 10)"A. PARALLEL"

660  PRINT  TAB( 10)"B. PRESPECTI
     VE"
670  GET A$: PRINT : PRINT : PRINT
```

```
675  REM
676  REM FOR PARALLEL SET
677  REM VIEWPOINT AT INFINITY
678  REM (1000), AND SET SCALE
679  REM
680  IF A$ <  > "A" GOTO 730
690 RH = 1000
700  PRINT  TAB( 5)"WHAT SCALE FA
     CTOR DO YOU WANT";: INPUT SL

710  PRINT : PRINT : PRINT
720  GOTO 810
722  REM
723  REM FOR PRESPECTIVE SET
724  REM SCALE TO 1, AND SET
725  REM VIEWPOINT.
726  REM
730  IF A$ <  > "B" GOTO 790
740 SL = 1
750  PRINT  TAB( 5)"WHAT SIZE WIN
     DOW DO YOU WANT?"
760  PRINT "THIS SIZE SHOULD BE L
     ARGER THAN THE      OBJECT.";

770  INPUT RH
780  GOTO 810
785  REM
790  PRINT : PRINT : PRINT : PRINT
      TAB( 5)"ILLEGAL ENTRY, TRY
     AGAIN.": PRINT : PRINT : PRINT

800  GOTO 640
810  PRINT : PRINT : PRINT
820  PRINT  TAB( 5)"HOW MANY DEGR
     EES OFF THE X AXIS DO"
830  PRINT "YOU WANT THE STARTING
      VIEWPOINT";: INPUT TH
840 TH = TH * 3.141592654 / 180
850  PRINT "HOW MANY DEGREES OFF
     THE Z-AXIS";: INPUT PH
860 PH = PH * 3.141592654 / 180
870  GOSUB 1100
875  GOSUB 7250
880  PRINT : PRINT : PRINT
890  PRINT  TAB( 5)"DO YOU WANT T
     O"
900  PRINT  TAB( 10)"R. ROTATE TH
     E OBJECT"
910  PRINT  TAB( 10)"A. ALTER PRO
     JECTION TYPE"
920  PRINT  TAB( 10)"E. EXIT PROG
     RAM"
```

```
930  GET A$
940  IF A$ = "A" GOTO 610
950  IF A$ <   > "R" GOTO 1090
960  PRINT : PRINT : PRINT
970  PRINT  TAB( 5)"HOW MANY DEGR
     EES ALONG THE"
980  PRINT "X-AXIS DO YOU WANT IT
      ROTATED";: INPUT TE
990  PRINT "HOW MANY DEGREES ALON
     G THE Z-AXIS";: INPUT PI
1000  PRINT "HOW MANY STEPS DO YO
     U WANT";: INPUT L
1010 TE = TE / L:PI = PI / L
1020 TE = TE * 3.141592654 / 180
1030 PI = PI * 3.141492654 / 180
1040  FOR K = 1 TO L
1050 TH = TH + TE:PH = PH + PI
1060  GOSUB 1100
1065  GOSUB 7250
1070  NEXT K
1080  GOTO 880
1090  TEXT : END
1092  REM
1094  REM SUBROUTINE: REMOVE
1096  REM HIDDEN LINES.
1098  REM
1100 S1 =  SIN (TH)
1101 S2 =  SIN (PH)
1102 C1 =  COS (TH)
1104 C2 =  COS (PH)
1110 XE = RH * S2 * C1
1115 YE = RH * S2 * S1
1120 ZE = RH * C2
1124  REM
1125  REM LOOP: CHECK FOR VISIBLE

1126  REM SURFACE
1127  REM
1130 I = 1
1135  FLASH : PRINT "WAIT FOR IMA
     GE": NORMAL
1140  IF S(I,1) = 0 GOTO 1260
1150 WX = XE - (V(E(S(I,1),1),1) -
     CX)
1160 WY = YE - (V(E(S(I,1),1),2) -
     CY)
1170 WZ = ZE - (V(E(S(I,1),1),3) -
     CZ)
1180  IF N(I,1) * WX + N(I,2) * W
     Y + N(I,3) * WZ > 0 GOTO 124
     0
1184  REM
1185  REM LOOP: SET VISIBLE
```

```
1186  REM EDGES
1187  REM
1190  FOR J = 1 TO 10
1200  IF S(I,J) = 0 GOTO 1230
1210 E(S(I,J),3) = 1
1230  NEXT J
1240 I = I + 1
1250  GOTO 1140
1253  REM NESTED LOOPS: FIND
1254  REM ALL EDGES THAT
1255  REM ARE SET TO BE DRAWN
1256  REM TWICE AND RESET
1257  REM EXTRA EDGES.
1258  REM
1260  FOR I = 1 TO 40
1262  IF I = 10 THEN  FLASH : PRINT
     "STILL PROCESSING"
1264  IF I = 20 THEN  PRINT "ONE
     MOMENT PLEASE"
1266  IF I = 30 THEN  INVERSE : PRINT
     "THERE IS ABSOLUTLY NO CAUSE
      FOR CONCERN": NORMAL
1270  IF E(I,3) <  > 1 GOTO 1330
1280  FOR J = 1 TO 40
1285  IF J = I GOTO 1320
1290  IF E(I,1) <  > E(J,1) AND E
     (I,1) <  > E(J,2) GOTO 1320
1300  IF E(I,2) <  > E(J,1) AND E
     (I,2) <  > E(J,2) GOTO 1320
1310 E(J,3) = 0
1320  NEXT J
1330  NEXT I
1350  RETURN
7200  REM
7210  REM DRAW THE OBJECT
7220  REM
7230  PRINT " ": PRINT " ": PRINT
     " ": PRINT " ": PRINT " "
7250  HGR
7260  POKE 34,20
7270  HOME
7700 I = 1
7800  IF E(I,1) = 0 GOTO 9850
7805  IF E(I,3) = 0 GOTO 9700
7850 RE = 0
7900 X = V(E(I,1),1) - CX
8000 Y = V(E(I,1),2) - CY
8100 Z = V(E(I,1),3) - CZ
8200 X1 =  - X * S1 + Y * C1
8300 Y1 =  - X * C1 * C2 - Y * S1
      * C2 + Z * S2
8400 Z1 =  - X * S2 * C1 - Y * S2
      * S1 - Z * C2 + RH
```

```
8500 XF = (D * (X1 / Z1) * SC * S
     L) + 140
8600 YF = 96 - (D * (Y1 / Z1) * S
     L)
8700 X = V(E(I,2),1) - CX
8800 Y = V(E(I,2),2) - CY
8900 Z = V(E(I,2),3) - CZ
9000 X2 =  - X * S1 + Y * C1
9100 Y2 =  - X * C1 * C2 - Y * S1
      * C2 + Z * S2
9200 Z2 =  - X * S2 * C1 - Y * S2
      * S1 - Z * C2 + RH
9300 XT = (D * (X2 / Z2) * SC * S
     L) + 140
9400 YT = 96 - (D * (Y2 / Z2) * S
     L)
9440  REM
9450  REM CALL CLIP
9460  REM
9500  GOSUB 11000
9550  IF RE = 1 GOTO 9700
9600  HPLOT XF,YF TO XT,YT
9700 I = I + 1
9800  GOTO 7800
9850  FOR I = 1 TO 40:E(I,3) = 0:
      NEXT I
9900  PRINT "PRESS ANY KEY TO CON
     TINUE?": GET A$
10000  RETURN
10100  PRINT "DO YOU WISH TO:"
10200  PRINT  TAB( 10)"C. CHANGE
     VIEW"
10300  PRINT  TAB( 10)"E. EXIT PR
     OGRAM"
10400  GET A$: PRINT : PRINT : PRINT

10500  IF A$ = "C" GOTO 625
10600  REM
10610  REM SUBROUTINE: CLIP
10620  REM ALL LINES SO THAT
10630  REM THEY DO NOT GO
10640  REM PAST THE SCREEN
10650  REM EDGE
10660  REM
11000 L1 = 0:R1 = 0:T1 = 0:B1 = 0
     :L2 = 0:R2 = 0:T2 = 0:B2 = 0

11090  REM CLIP FIRST POINT
11100  IF XF >  = L GOTO 11300
11200 L1 = 1
11300  IF XF <  = R THEN 11500
11400 R1 = 1
11500  IF YF >  = T THEN 11700
11600 T1 = 1
11700  IF YF <  = B THEN 11900
11790  REM CLIP SECOND POINT
11800 B1 = 1
11900  IF XT >  = L THEN 12100
12000 L2 = 1
12100  IF XT <  = R THEN 12300
12200 R2 = 1
```

```
12300  IF YT >  = T THEN 12500
12400 T2 = 1
12500  IF YT <  = B THEN 12700
12600 B2 = 1
12700  IF L1 <  > 0 OR L2 <  > 0 OR
     R1 <  > 0 OR R2 <  > 0 GOTO
     12900
12800  IF T1 = 0 AND T2 = 0 AND B
     1 = 0 AND B2 = 0 THEN  RETURN
12900  IF L1 <  > 0 AND L2 <  > 0
     THEN RE = 1
12910  IF R1 <  > 0 AND R2 <  > 0
     THEN RE = 1
12930  IF T1 <  > 0 AND T2 <  > 0
     THEN RE = 1
12940  IF B1 <  > 0 AND B2 <  > 0
     THEN RE = 1
13000  IF RE = 1 THEN  RETURN
13100  IF L1 <  > 1 GOTO 13500
13200 YF = YF + (YT - YF) * (L -
     XF) / (XT - XF)
13300 XF = L
13400  GOTO 11000
13500  IF R1 <  > 1 GOTO 13900
13600 YF = YF + (YT - YF) * (R -
     YF) / (XT - XF)
13700 XF = R
13800  GOTO 11000
13900  IF T1 <  > 1 GOTO 14300
14000 XF = XF + (XT - XF) * (T -
     YF) / (YT - YF)
14100 YF = T
14200  GOTO 11000
14300  IF B1 <  > 1 GOTO 14700
14400 XF = XF + (XT - XF) * (B -
     YF) / (YT - YF)
14500 YF = B
14600  GOTO 11000
14700  IF L2 <  > 1 GOTO 15100
14800 YT = YF + (YT - YF) * (L -
     XF) / (XT - XF)
14900 XT = L
15000  GOTO 11000
15100  IF R2 <  > 1 GOTO 15500
15200 YT = YF + (YT - YF) * (R -
     XF) / (XT - XF)
15300 XT = R
15400  GOTO 11000
15500  IF T2 <  > 1 GOTO 15900
15600 XT = XF + (XT - XF) * (T -
     YF) / (YT - YF)
15700 YT = T
15800  GOTO 11000
15900  IF B2 <  > 1 GOTO 11000
16000 XT = XF + (XT - XF) * (B -
     YF) / (YT - YF)
16100 YT = B
16200  GOTO 11000

]
```

The second program is "ISOMETRIC". This program will give the starting point for a isometric drawing given width and hieght of the drawing area, and the width, depth, and hieght of the object to be drawn. For example say you want to draw an object that has a width of 4 inches, a depth of 3 inches, and a height of 2 inches. Say you want to draw this object in an area 10 inches by 7 inches. this program will let you pick a scale to draw it in and then either give you the starting point are tell the scale is too large and have you pick another.

Here is a sample run and listing of the program.

```
RUN ISOMETRIC
    THIS IS A PROGRAM TO CENTER A
ISOMETRIC DRAWING OF AN OBJECT IN A
GIVEN DRAWING AREA.
    THIS PROGRAM WILL WORK WITH EITHER
ENGLISH OR METRIC UNITS OF MESUREMENT.

    ENTER THE WIDTH OF YOUR DRAWING
AREA?10
    ENTER THE HIEGHT OF YOUR DRAWING
AREA?7

DIMENSIONS OF THE OBJECT TO BE DRAWN.
    ENTER THE WIDTH    ?4
    ENTER THE DEPTH    ?3
    ENTER THE HIEGHT   ?2

    ENTER THE SCALE FACTOR, i. e.
1 = FULL SIZE: 2 = DOUBLE SIZE:
.5 = HALF SIZE: .25 = 1/4th SIZE:
?7



    THE DRAWING IS TO LARGE FOR THE
AREA. PLEASE PICK A DIFFERENT SCALE.



    ENTER THE SCALE FACTOR, i. e.
1 = FULL SIZE: 2 = DOUBLE SIZE:
.5 = HALF SIZE: .25 = 1/4th SIZE:
?1
```

```
    THE STARTING POINT SHOULD BE 5.43
UNITS FROM THE LEFT EDGE OF THE AREA,
AND .75 UNITS FROM THE BOTTOM EDGE
OF THE AREA.
```

```
DO YOU WANT TO RE-RUN THE PROGRAM (Y/N)?
]LIST

10  REM THIS PROGRAM WILL
20  REM HELP YOU CENTER AN
30  REM ISOMETRIC DRAWING.
40  HOME : PRINT : PRINT : PRINT

50  PRINT  TAB( 5)"THIS IS A PROG
     RAM TO CENTER A"
60  PRINT "ISOMETRIC DRAWING OF A
     N OBJECT IN A"
70  PRINT "GIVEN DRAWING AREA."
80  PRINT : PRINT : PRINT
82  PRINT  TAB( 5)"THIS PROGRAM W
     ILL WORK WITH EITHER"
84  PRINT "ENGLISH OR METRIC UNIT
     S OF MESUREMENT."
85  PRINT : PRINT : PRINT
90  PRINT  TAB( 5)"ENTER THE WIDT
     H OF YOUR DRAWING"
95  PRINT "AREA";: INPUT W
100  PRINT  TAB( 5)"ENTER THE HIE
     GHT OF YOUR DRAWING"
105  PRINT "AREA";: INPUT H
110  PRINT : PRINT : PRINT
115  PRINT "DIMENSIONS OF THE OBJ
     ECT TO BE DRAWN."
120  PRINT  TAB( 5)"ENTER THE WID
     TH   ";: INPUT W2
140  PRINT  TAB( 5)"ENTER THE DEP
     TH   ";: INPUT D1
150  PRINT  TAB( 5)"ENTER THE HIE
     GHT  ";: INPUT H2
151  REM
152  REM ENTER SCALE
153  REM
154  PRINT : PRINT : PRINT
155  PRINT  TAB( 5)"ENTER THE SCA
     LE FACTOR, i. e."
156  PRINT "1 = FULL SIZE; 2 = DO
     UBLE SIZE; "
```

```
157  PRINT ".5 = HALF SIZE; .25 =
      1/4th SIZE;"
158  INPUT SC: PRINT : PRINT : PRINT
     : PRINT
159 WO = W2 * SC:D = D1 * SC:H1 =
     H2 * SC
160  REM
170  REM COMPUTE THE CENTER.
180  REM
190 X = WO * .5
200 Y = D * .5
210 Z = X + Y + H1
220 PC =  COS (30 * 3.1416 / 180)

230 X1 = WO * PC
340 Y1 = D * PC
350 Z1 = X1 + Y1
360 I = (W - Z1) / 2 + X1
370 J = (H - Z) / 2
374 I =  INT (I * 100 + .5) / 100

375 J =  INT (J * 100 + .5) / 100

380  HOME : PRINT : PRINT : PRINT
     : PRINT : PRINT : PRINT
385  IF Z1 > W OR J < 0 GOTO 440
390  PRINT  TAB( 5)"THE STARTING
     POINT SHOULD BE ";I
400  PRINT "UNITS FROM THE LEFT E
     DGE OF THE AREA."
410  PRINT "AND ";J;" UNITS FROM
     THE BOTTOM EDGE"
415  PRINT "OF THE AREA."
420  PRINT : PRINT : PRINT : PRINT
     : PRINT
430  GOTO 600
440  FOR S = 1 TO 200:A = S * 1: NEXT
      S
442  INVERSE
445  PRINT  TAB( 5)"THE DRAWING I
     S TO LARGE FOR THE"
450  PRINT "AREA. PLEASE PICK A D
     IFFERENT SCALE."
455  NORMAL
460  GOTO 154
600  PRINT : PRINT : PRINT
610  PRINT "DO YOU WANT TO RE-RUN
      THE PROGRAM (Y/N)?";: GET X
     $
620  IF X$ = "N" GOTO 700
630  IF X$ = "Y" GOTO 85
640  GOTO 600
700  HOME
710  END

]
```

```
RADIO SHACK  TRS-80 AUTHOR I      Lesson: TEXT7
Version: 01/10/84        Page: 02 of 03   Page type: TEXT
```

PROGRAM 7. CABINET DRAWING ROUTINES

This program was designed to demonstrate the ability of a small, inexpensive (relatively) system to aid in drafting and design fields.

The program draws fairly clear and numerous combinations of kitchen cabinets. An entire kitchen can be easily designed and redesigned completely from menu choices.

Some knowledge of drafting terms is helpful, but not neccessary. A few experiments will

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```
RADIO SHACK  TRS-80 AUTHOR I      Lesson: TEXT2
Version: 01/10/84          Page: 03 of 03   Page type: TEXT

 ---------------------------------------------------------------------
 '                                                                   !
 '    .      illustrate the different cabinets available             !
 '    .      if the names are not familiar.                          !
 '    .                                                              !
 '    .        In order to draw cabinets that are left of            !
 '    .      the current pen position, a NO CABINET MOVE             !
 '    .      LEFT choice should be selected and then the             !
 '    .      appropriate distance in inches entered.  A              !
 '    .      wall cabinet is one instance of this if it is           !
 '    .      requested after drawing a base cabinet.                 !
 '    .                                                              !
 '    .        The plotter should be reset to REMOTE  before         !
 '    .      and after each use or if a mistake is made.             !
 ---------------------------------------------------------------------
```

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```
10 '********* CABINET DRAWING ROUTINES **************
20 '
30 '   THIS PROGRAM WILL AID IN THE LAYOUT OF CABINETS.
40 ' THERE ARE SEVERAL CHOICES OF SCALE AND DIMENSIONS
50 'TO CHOSE FROM.  ALL SELECTIONS ARE MENU DRIVEN AND
60 'INPUT PROTECTED. THE PROGRAM IS DESIGNED TO RUN ON
70 'TRS-80 MODEL III WITH A MULTI PEN PLOTTER.
72 '  THIS PROGRAM IS DESIGNED SO ADDITIONAL ROUTINES CAN
73 'BE ADDED EASILY. AN ADDITION TO THE MENU AND JUMP
74 'TABLE WILL SET UP ANY NEW SUBROUTINE ADDED AT THE END.
75 '   THERE ARE EXAMPLES OF SEVERAL TYPES OF PLOTTER ROUTINES
76 '  IN THIS LISTING. THE SCALE USED IS 1/2 IN. = 1 FOOT. BUT
77 ' THIS IS ALSO EASILY CHANGED BY REPLACING THE VERTICAL
78 ' CONSTANTS BY A VARIABLE AS THE HORIZONTAL VALUES ARE.
79 ' THE SCALE MENU WAS REMOVED IN THIS VERSION DUE TO TIME
80 ' LIMITATIONS FROM LINE NUMBERS 350-400.
81 '
82 '                          MIKE RAINES    6-83
83 '
90 ON ERROR GOTO 5000
95 CLEAR 4500
100 GOSUB 7000 '        ** SET UP PLOTTER PORTS
110 '
120 ' **************** MAIN MENU ********************
130 '
140 CLS:PRINT@70,"PLEASE PRESS ENTER AFTER EVERY ANSWER "
150 PRINT@463,"WHAT IS YOUR FIRST NAME ?"
160 INPUT FIR$
170 PRINT@591,"WHAT IS YOUR LAST NAME ?"
180 INPUT LN$
190 PRINT@778,"WHAT CLASS ARE YOU ENROLLED IN ? "
200 INPUT CL$
210 CLS
212 PRINT@335,"WHAT SCHOOL ARE YOU FROM ?"
213 INPUT SC$
214 PRINT@463,"ENTER THE DATE IN THE  FORM OF MO-DAY-YR":PRINT
215 INPUT DA$
216 '
217 XX=0: GOSUB 8000 ' DRAW BORDER AND TITLE
218 '
400 S = 8.333
405 '
407 ' *************  CABINET TYPE MENU ***************
410 '
411 CLS:PRINT@332,"   WHICH ROOM ARE THE CABINETS FOR ? " :PRINT
420 '
430 CLS:PRINT"CHOOSE THE NUMBER OF THE CABINET TO BE DRAWN ":PRINT
432 FL=0
440 PRINT "    (1)   BASE                (14)   WALL "
450 PRINT "    (2)   BLIND RIGHT BASE    (15)   BLIND RIGHT WALL"
460 PRINT"    (3)   BLIND LEFT BASE     (16)   BLIND LEFT WALL"
470 PRINT "    (4)   FOUR DRAWER BASE    (17)   OVEN    "
480 PRINT "    (5)   SINK                (18)   DOUBLE OVEN"
490 PRINT "    (6)   DISHWASHER          (19)   FURRED CEILING"
500 PRINT "    (7)   TRASH COMPACTOR     (20)   STORAGE"
510 PRINT "    (8)   RANGE               (21)   DESK  "
520 PRINT "    (9)   TRAY STORAGE        (22)   MANUAL CONTROL
```

```
5[illegible] PRINT "   (10)   [illegible]                (23)   RETURN TO MAIN MENU"
540 PRINT "   (11)   ROTATING CORNER RT. (24)   NO CAB. MOVE RT. "
550 PRINT"   (12)  TURNING CORNER LT. (25)   NO CAB. MOVE LT.
552 PRINT "   (13)   WALL W/ HOOD           (26)   EXIT PROGRAM "
560 INPUT TY: IF TY = 23 THEN 120
561 IF TY = 26 THEN 4950
562 IF TY = 24 THEN  GOSUB 3000
563 IF TY = 25 THEN GOSUB 3500
564 IF FL = 1 THEN 430
565 IF TY>0AND TY<28 THEN570
566 CLS:PRINT"ENTER A NUMBER BETWEEN 1 AND 25 ONLY."
567 FOR X=1TO 150:NEXT X:GOTO 430
570 IF TY >13 AND TY <17 THEN GOSUB 1500
573 IF TY = 22 OR TY = 6  OR TY = 7   THEN 642
575 GOSUB 2500
580 XX = XX + WY
600 IF TY=1 AND WY=27 THEN GOTO  12000
642 GOSUB 9000
644 GOTO 430
849 '
850 ' MANUEL PLOT ROUTINE *************
855 LPRINT C$
860 H = USR3(0)
865 RETURN
900 '
905 ' PLOTTER CONTROL ROUTINE ************
910 '
915 LPRINT"  ::   R  "
920 LPRINT " ";X;" ";Y;" "
922 FL=1
925 H = USR3(0) ' **** WAIT FOR BUFFER RESPONSE ****
930 RETURN
932 '
934 ' ***** SUBROUTINE DOWN ******
936 '
938 LPRINT " :: R D "
940 RETURN
942 '
944 ' ****** SUBROUTINE UP *******
946 '
948 LPRINT " :: R U "
950 RETURN
952 '
954 ' ****** SUBROUTINE ASSIGN ORIGIN **
956 '
958 LPRINT " :: O "
960 RETURN
962 '
964 ' ******* SUBROUTINE GOTO ORIGIN **
966 '
968 LPRINT " :: A 0,0 R "
970 RETURN
972 '
974 ' ******* SUBROUTINE KNOB **********
976 '
978 LPRINT ":: CC 0,4 "
980 RETURN
1000 '
1010 ' ***** SINK AND BASE ROUTINES **
1020 '
1030 WID = INT(S*WY)
1032 GOSUB 934
```

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```
1040 X = WID: Y = 0 :GOSUB 900: GOSUB 956
1041 IF TY = 5 OR TY = 9 OR TY = 10  OR TY = 4 OR TY = 6 OR
     TY = 7 THEN 1050
1042 SH=INT (17.5*S)
1043 GOSUB 944
1044 X=0   :Y=SH:GOSUB 900:GOSUB 934
1045 X= WID:Y=0
1046 LPRINT " ;: L3"
1047 GOSUB 900:GOSUB 944
1048 LPRINT " ;: L0 A 0,0 R D "
1050 Y = 288 : X = 0 :GOSUB 900
1060 Y = 0 : X = -WID : GOSUB 900
1070 Y = -288   : X = 0: GOSUB 900
1080 X = 0 : Y = 33  : GOSUB 900
1090 X = WID : Y = 0: GOSUB 900
1100 GOSUB 944
1110 X = 0:Y = 267:GOSUB 900
1120 GOSUB 934
1122 X = -WID : Y = 0 :GOSUB 900
1124 GOSUB 944
1126 X=4 :Y=-263   :GOSUB 900
1128 GOSUB 934: IF TY = 4 OR TY = 6 OR TY = 7 THEN RETURN
1130 IF WY < 27 THEN 1200
1131 '
1132 ' ***************** ONE DOOR ROUTINE *****
1134 '
1136 WID = WID - 8
1138 X=WID:Y=0:GOSUB 900
1140 X=0:Y=191 : GOSUB 900
1142 X=-WID:Y=0: GOSUB 900
1144 X=0:Y=-191   : GOSUB 900
1146 GOSUB 944
1148 X=0:Y=197 : GOSUB 900
1150 GOSUB 934
1152 X=WID:Y=0:GOSUB 900
1154 X=0:Y=50 :GOSUB 900
1156 X=-WID:Y=0:GOSUB 900
1158 X=0:Y=-50  :GOSUB 900
1160 GOSUB 944
1162 X=INT(WID/2):Y=25 :GOSUB 900
1163 IF TY = 5 OR TY = 8 THEN 1166
1164 GOSUB 974
1166 CLS :PRINT "DO YOU WANT THE KNOB ON THE LEFT (L) OR
     RIGHT (R) OF THE CABINET DOOR ? "
1168 K$ = INKEY$ : IF K$ = "" THEN 1168
1170 IF K$ = "L" THEN  1176
1172 IF K$="R" THEN 1184
1174 GOTO 1166
1176 X=-INT((WID/2)-20):Y=-64  :GOSUB 900
1178 GOSUB 974:GOSUB 944:WID = WID+8
1180 X=0:Y=-(260 ):GOSUB 900
1182  GOTO 1400 ' GO TO LABEL ROUTINE
1184 X=INT(WID/2-20):Y=-64:GOSUB 900
1186 GOSUB 974: GOSUB 944: WID = WID + 8
1188 X=-(WID-40): Y=-252  : GOSUB 900
1190 '
1193 GOTO 1400 ' GOTO LABEL ROUTINE
1200 '
```

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```
1202 '   ****** TWO DOOR ROUTINE  *******
1204 '
1206 GOSUB 934:DWI=INT((WID-14)/2)
1208 X=DWI:Y=0 :GOSUB 900
1210 X = 0:Y=191 :GOSUB 900
1212 X=-DWI:Y=0:GOSUB 900
1214 X=0: Y=-191   : GOSUB 900
1216 GOSUB 944
1218 X=DWI+6:Y=0:GOSUB 900
1220 GOSUB 934
1222 X=DWI:Y=0:GOSUB 900
1224 X=0:Y=191 : GOSUB 900
1226 X=-DWI:Y=0:GOSUB 900
1228 X=0:Y=-191  :GOSUB 900
1230 GOSUB 944
1232 X=0:Y=197 :GOSUB 900
1234 GOSUB 934
1236 X=DWI:Y=0 :GOSUB 900
1238 X=0:Y=50 : GOSUB 900
1239 IF TY = 5 OR TY = 8 THEN 1270
1240 X=-DWI:Y=0: GOSUB 900
1242 X=0:Y=-50     :GOSUB 900:GOSUB944
1244 X=-4:Y=0:GOSUB 900:GOSUB 934: X=0:Y=50:GOSUB 900:X=-DWI
     :Y=0:GOSUB 900
1245 X=0: Y=-50   : GOSUB 900:X=DWI:Y=0:GOSUB 900
1246 GOSUB 944:X=INT(DWI/2):Y=25 : GOSUB 900:GOSUB 934
1248 GOSUB 974:GOSUB 944
1250 X=-(DWI):Y=0:GOSUB 900
1252 GOSUB 974:GOSUB 944
1254 X=INT((DWI/2)-20) :GOSUB 900
1255 X=0 :Y=-64:GOSUB 900
1256 GOSUB 974:GOSUB 944
1258 X=46: Y=0 :GOSUB 900:GOSUB 974:GOSUB 944
1260 X=-INT(10+DWI):Y=-260   : GOSUB 900
1262 GOTO 1400
1265 ' ***** SINK ROUTINE *****
1270 X = -(2*DWI+6):Y = 0:GOSUB 900
1272 X = 0: Y = -50: GOSUB 900
1274 X = DWI + 6:Y = 0: GOSUB 900
1276 GOSUB 944
1278 X = -INT(DWI/2+6): Y = 0 :GOSUB 900
1279 X=0:Y=14: GOSUB 900
1280 GOTO 1254
1400 ' LABEL ROUTINE ************
1401 IF TY = 2 OR TY = 3 OR TY = 9 OR TY = 10 OR TY = 8 THEN RETURN
1402 SB$="B."
1403 IF TY=5 THEN SB$="S."
1404 LPRINT " ;: S12 ";+ SB$
1406 LPRINT STR$ (WY);CHR$(95)
1407 GOSUB 964
1408 LPRINT " U A 0,0 "
1409 RETURN
1410 '
1500 '************DETERMINE HEIGHT ****************
1501 '
1510 CLS:PRINT"CHOOSE AN APPROPRIATE HEIGHT FOR THE CABINET."
1520 PRINT
1530 PRINT"WALL CABINETS CAN BE 12, 15, 18, 24 OR 32 INCHES HIGH"
```

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```
1550 PRINT  "JUST ENTER THE HEIGHT  OF THE CHOICES ABOVE YOU WISH YOUR"
1551 PRINT'CABINET TO BE"
1560 INPUT HT
1570 IF HT<>12AND HT<>15ANDHT<>18AND HT<>24ANDHT<>32ANDHT<>44ANDHT
     <>63ANDHT<>84 THEN1600
1580 RETURN
1590 '
1600 PRINT"ENTER ONE OF THE SELECTIONS ONLY.":FOR G= 1 TO 150:NEXT
     G: GOTO 1500
2499 '
2500 ' *********** DETERMINE WIDTH ***************
2501 '
2510 CLS:PRINT"  CHOOSE AN APPROPRIATE WIDTH FOR YOUR CABINETS. THE "
2520 PRINT" CABINETS LISTED BELOW COME IN THREE (3) INCH INCREMENTS
     ONLY.  CHOOSE YOUR WIDTH IN THE RANGES LISTED FOR THE CABINET WA
NTED.  ENTER YOUR VALUE IN INCHES."
2540 PRINT"         KITCHEN            *"
2550 PRINT "-------------------------"
2560 PRINT"    BASE         12-51    *"
2570 PRINT"    BLIND BASES  36-51    *"
2580 PRINT"    SINK         24-72    *"
2590 PRINT"    WALL         24-51    *"
2600 PRINT"    BLIND WALL   24-75    *"
2610 PRINT"    OVEN         24-36    *"
2620 PRINT"    BROOM        12-48    *"
2630 PRINT"    STORAGE      12-48    *"
2635 PRINT"    RANGE        24-51    * "
2636 PRINT"    DESK         24-36    * "
2640 '
2650 INPUT WY:TEM=WY
2660 FOR R=1 TO 35
2665 TEM=TEM-3
2670 IF TEM=0THEN R=35
2672 NEXT R
2673 IF WY<06OR WY >51  THEN2676
2674 IF TEM=0 THEN 2900
2676 PRINT " ENTER A VALUE IN THE RANGE ONLY":FOR F=1 TO 1000:
     NEXTF:GOTO 2500
2701 GOTO 4950
2900 RETURN
2999 '
3000 ' MOVE RIGHT ROUTINE *************
3005 '
3010 CLS:PRINT "ENTER THE DISTANCE YOU WISH TO MOVE RIGHT IN INCHES"
3015 INPUT MR:X = INT(MR * S):Y = 0
3020 GOSUB 900:GOSUB 954
3022 XX = XX + ML
3025 RETURN
3499 '
3500 'MOVE LEFT ROUTINE **********
3505 '
3510 CLS:PRINT "ENTER THE DISTANCE YOU WISH TO MOVE LEFT IN INCHES"
3515 INPUT ML:X=-INT(ML*S):Y=0
3520 GOSUB 900 :GOSUB 954
3525 RETURN
4950 LPRINT ";: P0 H Z @ " :DEFUSR2=&H69:X=USR2(0)
4951 H=USR3(0)
4999 CLS:PRINT@460,"YOU HAVE LEFT THE PROGRAM.":END
5000 CLS:PRINT@468,"**** INPUT ERROR **** "
```

```
5001
5002 '
5010 PRINT@70."MAKE SURE WHAT YOU ENTER STARTED WITH A LETTER
     IF YOU ARE ANSWERING YOUR NAME OR CLASS."
5020 PRINT "  MAKE SURE YOU ONLY ENTER A NUMBER FOR MENU
     SELECTIONS."
5030 RESUME
7000 CLS:VM= 15360
7010 PRINTCHR$(23):PRINT@394,"ARCHITECHTURAL DETAILS "
7020 PRINT@532,"KITCHEN "
7030 CNT=0:CHAR=146
7040 FOR G = 194 TO 250
7050 POKE VM+ G,CHAR:NEXT G
7060 FOR H =  770 TO826
7070 POKE VM+H,CHAR:NEXTH
7080 FOR I = 194 TO 770 STEP 64
7090 POKE VM+I,CHAR:NEXT I
7100 FOR J = 250 TO 826 STEP 64
7110 POKE VM+J,CHAR: NEXTJ
7120 IF CNT=2 THEN 7150
7130 CNT=CNT+1:CHAR = CHAR + 10
7140 FOR T = 1 TO100:GOTO7040
7150 FOR T = 1 TO 1000:RETURN
7200 RETURN
7999 '
8000 ' PLOTTER SET UP ROUTINE ***********************
8010 '
8020 DEFUSR1 = &H5A
8030 POKE 16890.&HFF   ' *** WAIT ***
8040 BR = 10            'SET BAUD RATE AT 2400 ******
8050 POKE 16888,(16*BR)+BR
8060 POKE 16889,127
8070 X=USR1(0)
8080 DEFUSR0=&H006C
8090 POKE &H4220.82
8100 POKE &H4221,79  ' *** R0 IS RS 232 OUTPUT ***
8110 POKE &H4222,80
8120 POKE &H4223,82
8130 X=USR0(0)
8140 DEFUSR3 = &H0050
8160 ' ***** DRAW INITIAL OUTLINE ******
8170 '
8180 LPRINT" X;: P1 L0  HAD 1850,0 1850,1400 0,1400 0,0 0,100
     1850,100 U 50,30 "; CHR$(94)
8190 LPRINT "  S12 NAME: " ; " ";FIR$ ; " "; LN$ ;CHR$(95)
8191 LPRINT" ;: A 600,30 ";CHR$(94)
8192 LPRINT " ;: S12 CLASS:  " ; " ";CL$;CHR$(95)
8193 LPRINT" ;: A 925,30"; CHR$(94)
8194 LPRINT " S12 SCHOOL: ";" "; SC$;CHR$(95)
8195 LPRINT " ;: A 1600,30 ";CHR$(94)
8196 LPRINT ";: S12 ";" ";DA$;CHR$(95)
8198 LPRINT ";: P1 HAU 100,400 O R ";CHR$(94)
8999 RETURN
9000 '
9010 ' ************ JUMP ROUTINE *************
```

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```
9020 '
9030 '  *** THIS SECTION DECIDES WHERE TO GO TO DRAW
     THE CABINET REQUESTED.
9035 IF TY=1 OR TY = 5 THEN GOSUB 1000
9040 IF TY = 14 THEN GOSUB 13000
9045 IF TY = 2 OR TY = 3 THEN GOSUB 13500
9050 IF TY = 15 OR TY = 16 THEN GOSUB 13800
9055 IF TY = 10 OR TY = 9 THEN GOSUB 13900
9060 IF TY = 22 THEN GOSUB 14000
9065 IF TY = 8 THEN 14200
9070 IF TY = 6 OR TY = 7 OR TY = 4 THEN GOSUB 14500
9075 IF TY = 18 OR TY = 17 OR TY = 20 THEN GOSUB 15000
9080 IF TY = 13 THEN GOSUB 16000
9085 IF TY = 12 OR TY = 11 THEN GOSUB 16100
9090 IF TY = 21 THEN GOSUB 16300
9095 IF TY = 19 THEN GOSUB 16500
9998 RETURN
12000 ' ********  27 INCH BASE  *********
12005 '
12007 LPRINT ";: RD 225,0 O U 0,144 D L3 -225,0 U L0 A 0,0 R "
12010 LPRINT " ;: D 0.288 -225.0 0,-288 0,33 225.0 U 0,267 D -225.
      0 U 0,-300 4,37 D 105,0 0,191 -105,0 0. 191 U 112,0 D 105.0
      0.191
 -105,0 0,-191 U -112,197 D 217,0 0.50 -217,0 0,-50 U 108,25 D CC
      0,4 U -23,-64 D CC 0,4 U 47,0 D CC 0,4 U -136,-195 "
12012 LPRINT " 20,-60 S12 B. 27 ";CHR$(95)
12014 LPRINT " U A 0,0 "
12015 GOTO 430
12050 '
13000 '
13005 ' *************** WALL CABINET ROUTINE **********
13010 '
13015 GOSUB 944
13020 X=0 :Y=INT(84*S): GOSUB 900
13025 GOSUB 934
13030 XW= INT (S*WY)
13035 YW = INT(S*HT)
13040 X = XW:Y = 0:GOSUB 900: GOSUB 954
13045 X=0 : Y = -YW: GOSUB 900
13050 X = -XW: Y = 0: GOSUB 900
13055 X = 0 : Y = YW: GOSUB 900
13060 GOSUB 944 '                              ' PICK UP PEN
13065 X = 4: Y = -4 '
13070 IF WY> 24 THEN 13195
13071 '
13072 '   *****ONE DOOR ROUTINE ****
13073 '
13075 XW = XW - 8 :YW = YW -8:GOSUB 900: GOSUB 934 'PEN DOWN,
13080 X = XW: Y = 0: GOSUB 900
13085 X = 0 : Y = -YW: GOSUB 900
13090 X = -XW: Y = 0: GOSUB 900
13095 X = 0: Y = YW : GOSUB 900
13100 GOSUB 944 '                              PEN UP
13105 CLS: PRINT "DO YOU WANT THE KNOB ON THE LEFT (L) OR THE
      RIGHT(R) OF THE CABINET ?"
13110 K$= INKEY$:IF K$= "" THEN 13110
13115 IF K$ = "R" THEN 13135
13120 '                       LEFT KNOB
```

```
13125 X = 20 :Y = -YW + 20 :GOSUB 900: GOSUB 974:GOSUB 944
13130 GOSUB 964: GOTO 13150
13135 '                          RIGHT KNOB
13140 X = XW - 20: Y = -YW + 20: GOSUB 900: GOSUB 974:GOSUB 944
13145 GOSUB 964
13150 IF HT < 20 THEN 13325 '    GOTO LABEL ROUTINE
13155 X = 0 : Y = -INT( HT/2*S)
13156 IF HT <30 THEN 13164
13157 X=0:Y=-INT(HT/3*S): GOSUB 900: GOSUB 934
13158 LPRINT " ;: L3 "
13159 X=-(XW+8):Y=0: GOSUB 900:GOSUB 944
13160 X=XW+8:Y=0: GOSUB 900
13161 X=0:Y=-INT(HT/3*S)
13164 GOSUB 900:GOSUB 934
13165 LPRINT " ;: L3"
13170 X = -(XW+8): Y = 0: GOSUB 900
13175 GOSUB 944
13180 LPRINT "L0 A 0,0 R U"
13185 GOTO 13325 '    GOTO LABEL ROUTINE
13190 '
13195 ' **** TWO DOOR ROUTINE ****
13197 '
13200 GOSUB 900: GOSUB 934: YW = YW - 8
13205 DWI = INT(((S*WY)-14)/2)
13210 X = DWI: Y = 0: GOSUB 900
13215 X = 0: Y = -YW : GOSUB 900
13220 X = -DWI: Y = 0:GOSUB 900
13225 X = 0 :Y = +YW: GOSUB 900: GOSUB 944
13230 X = DWI + 6: Y = 0: GOSUB 900
13235 GOSUB 934: X = DWI: Y = 0: GOSUB 900
13240 X = 0: Y = -YW: GOSUB 900
13245 X = -DWI: Y = 0: GOSUB 900
13250 X = 0: Y =  YW: GOSUB 900
13255 GOSUB 944: X = 20: Y = -YW+20 :GOSUB 900
13260 GOSUB 974:GOSUB 944 '       DRAW RIGHT KNOB
13265 X = -46: Y = 0: GOSUB 900
13270 GOSUB 974: GOSUB 944: GOSUB 964:GOSUB 944
13271 X=0:Y=-HT*S: GOSUB 900
13272 IF HT < 20 THEN 13325
13275  IF HT < 30 THEN 13284
13276 FOR P = 1 TO 2
13277 X=0: Y=INT(HT/3*S):GOSUB 900
13278 GOSUB 934
13279 LPRINT " ;:L3 "
13280 X=-(XW): Y=0: GOSUB 900
13281 GOSUB 944:X=XW:Y=0:GOSUB 900:NEXT P
13282 LPRINT "L0 A 0,0 R U"
13283 GOTO 13325
13284 X=0: Y=INT(HT/2*S): GOSUB 900
13285 GOSUB 934
13300 LPRINT ";: L3"
13305 X = -(XW): Y = 0: GOSUB 900
13310 LPRINT "L0 U A 0,0 R "
13320 '
13324 GOSUB 964
13325 ' ****LABEL ROUTINE *****
13327 GOSUB 964: IF TY = 13 THEN RETURN
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```
13328 X = XW-10:IF TY=16 THEN X=X-80
13329 IF WY = 12 THEN X = X-20
13330 Y = -300 :GOSUB 900
13332 WL$ = "W."
13334 IF TY = 15 THEN WL$ = "B.R.W."
13335 IF TY = 15 OR TY = 16 THEN WY = WY + 12
13336 IF TY = 16 THEN WL$ = "B.L.W."
13337 IF TY = 13 THEN WL$=" W/H"
13340 LPRINT "  ;: S12 "; +WL$;CHR$(94)
13342 LPRINT STR$(HT)+STR$(WY); CHR$(95)
13345 GOSUB 944: GOSUB 964
13350 X = 0: Y =-INT(84*S):GOSUB 900
13370 RETURN
13500 '
13505 ' **** BLIND RIGHT AND LEFT BASE ROUTINES ***
13510 '
13520 WY = WY - 24
13525 IF TY = 3 THEN 13540
13530 GOSUB 1000 '                 DRAW WY-24 BASE
13535 '             BLIND RIGHT
13538 '
13540 GOSUB 964:XW = INT(24*S): YH = 288: GOSUB 934
13545 X = XW : Y = 0: GOSUB 900
13550  GOSUB 954
13555 X = 0: Y = YH :GOSUB 900
13560 X = -XW: Y = 0: GOSUB 900
13565 X = 0 : Y = -YH : GOSUB 900
13570 X = 0 :Y = 33 : GOSUB 900
13575 IF TY = 3 OR TY = 12 THEN 13635
13580 '
13585 X = 33:Y = 0: GOSUB 900
13590 LPRINT ";: L3 "
13595 X= (XW-33): Y =0: GOSUB 900
13600 LPRINT" ;: L0 U "
13605 X = -(XW-33):Y = 0: GOSUB 900
13610 GOSUB 934
13615 X = 0:Y = -33:GOSUB 900
13620 X = 0 :Y= 33: GOSUB 900: X=(XW-33):Y=255:GOSUB 900
13625 X = -XW: Y = 0: GOSUB 900: X = XW: Y = -255: GOSUB 900
      900:GOSUB 944:GOSUB 964: GOTO 13750
13630 GOSUB 944: X=0:Y=267:GOSUB 900: GOSUB 934:X=-XW:Y=0:GOSUB
13635 '           BLIND LEFT
13637 GOSUB 934:X=(XW-33): Y = 0: GOSUB 900
13640 LPRINT ";: L3 "
13645 GOSUB 934:X = 33: Y = 0: GOSUB 900
13650 LPRINT ";: L0 U "
13655 X = -33: Y=0:GOSUB 900
13660 GOSUB 934
13665 X=0: Y=-33: GOSUB 900
13670 GOSUB 944
13675 X=33: Y=33: GOSUB 900
13680 GOSUB 934
13685 X=-(XW):Y=255:GOSUB 900
13690 X=XW:Y=0:GOSUB 900
13695 X=-(XW):Y=-255:GOSUB 900: GOSUB 944
13697 X=0:Y=268:GOSUB 900:GOSUB 934
13698 X=XW:Y=0:GOSUB 900
13700 GOSUB 944: GOSUB 964
13702 IF TY = 12 THEN 13750
```

```
13705 GOSUB 1000:GOSUB 964
13750 X = -INT((WY+24)*S-40) : Y = -63:IF TY = 12 THEN X=X+50
13753 GOSUB 900
13755 BL$="B.L. "
13760 IF TY = 3 THEN BL$ = "B.R. "
13761 IF TY = 11 THEN BL$="R.C.B. RT."
13762 IF TY = 12 THEN BL$="R.C.B. LT."
13765 LPRINT ";: S12 ";+BL$
13770 LPRINT  STR$(WY+24);CHR$(95)
13775 GOSUB 964
13777 IF TY = 12 THEN 16125
13780 LPRINT "U A 0,0"
13785 RETURN
13800 '
13805 ' ******* BLIND LEFT AND RIGHT WALL ROUTINES ****
13810 '
13815 WW = INT(12*S): WH= INT(HT * S):WY = WY - 12
13820 IF TY = 16 THEN 13827
13825 GOSUB 13000 '   DRAW (WY-12) WALL CABINET ***********
13827 X=0 :Y=INT(84*S) : GOSUB 900
13830 GOSUB 934:X = WW: Y = 0: GOSUB 900
13835 X = 0: Y = -WH: GOSUB 900
13840 X = -WW: Y =0 :GOSUB 900
13845 X = 0: Y = WH: GOSUB 900
13850 X = WW: Y = -WH: GOSUB 900
13855 X = -WW: Y = 0: GOSUB 900
13860 X = WW: Y = WH: GOSUB 900
13865 GOSUB 954: GOSUB 944
13866 X=0: Y=-INT(84*S): GOSUB 900
13867 IF TY = 15 THEN RETURN
13870 IF TY = 16 THEN GOSUB 13000
13873 IF TY = 16 THEN RETURN
13874 IF TY = 12 THEN 16125
13875 X=0:Y=-INT(84*S): GOSUB 900: GOSUB 954
13880 RETURN
13900 '
13905 '     ******** TRAY STORAGE AND TOWEL DRYER ROUTINES ****
13910 '
13915 GOSUB 1000
13920 LB$="TD"
13922 X=-30 : Y=0: GOSUB 900
13925 IF TY = 9 THEN LB$= "BT"
13930 LPRINT ";: S12 ";+LB$
13935 LPRINT STR$(WY);CHR$ (95)
13940 GOSUB 964
13945 IF TY = 10 THEN 13970
13950 X = -INT(WID/2): Y = 33 : GOSUB 900
13955 GOSUB 934
13960 LPRINT ";: L3 "
13965 X = 0 : Y = 191: GOSUB 900: GOSUB 944
13970 LPRINT ";: L0 A 0,0 RU "
13975 RETURN
14000 '
14005 ' *******  MANUAL PLOT ROUTINE  *******
14010 '
14015 CLS: PRINT@73," MANUEL CONTROL COMMANDS ": PRINT
14020 PRINT " UP ARROW ................MOVE UP "
14025 PRINT " DOWN ARROW ...........MOVE DOWN "
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```
14030 PRINT " LEFT ARROW ............MOVE LEFT "
14035 PRINT " RIGHT ARROW ..........MOVE RIGHT "
14040 PRINT " P & UP ARROW ..............PEN UP "
14045 PRINT " P & DOWN ARROW .........PEN DOWN "
14050 PRINT " LEFT AND DOWN ARROW........HOME "
14055 PRINT " LEFT AND RIGHT ARROW.......TEST "
14060 PRINT " R .................RETURN TO MENU "
14065 '
14070 C$=";: R ":GOSUB 850
14075 L=PEEK(14420)
14080 IF L = 64 THEN C$ = "12 0 " :GOSUB 850
14085 IF L = 32 THEN C$ = "-12 0 " : GOSUB 850
14090 IF L = 8 THEN C$ = " 0 12 ": GOSUB 850
14095 IF L = 16 THEN C$  = " 0 -12": GOSUB 850
14100 IF L = 9 THEN C$ = "U ":GOSUB 850
14105 IF L = 17 THEN C$ = "D" : GOSUB 850
14110 IF L = 48 THEN C$ = " H " : GOSUB 850
14115 IF L = 96 THEN C$ = " T": GOSUB 850
14120 IF L <>4 THEN 14070
14150 RETURN
14200 '
14205 ' ********* RANGE ROUTINES ******
14210 '
14215 GOSUB 1000
14220 TR$= "R0"
14225 LPRINT ";: S12 ";+TR$
14230 LPRINT STR$(WY):CHR$(95)
14235 GOSUB 964
14240 LPRINT "UA 0.0"
14245 RETURN
14500 '
14510 ' **** 4 DRAWER BASE, DISHWASHER, AND COMPACTOR ****
14520 '
14540 IF TY = 7 THEN 14700
14550 IF TY = 4 THEN 14800
14560 ' *** DISHWASHER ***
14562 '
14563 WID = INT(S*24):WY = 24: GOSUB 1000
14564  WID=WID-8:GOSUB 944: X = -4:Y = 60: GOSUB 900: GOSUB 934
14566 X = WID+8: Y = 0 : GOSUB 900: GOSUB 944
14568 X = -4:Y = 4: GOSUB 900: GOSUB 934
14570 Y = 185: X = 0: GOSUB 900
14572 X = -WID: Y = 0: GOSUB 900
14574 X = 0: Y =-185: GOSUB 900
14576 X = WID: Y = 0: GOSUB 900: GOSUB 944
14578 X=-INT((WID/2)+25): Y = 165: GOSUB 900
14580 GOSUB 934:X = 50: Y=0: GOSUB 900
14582 X = 0: Y = 2: GOSUB 900
14584 X = -50: Y = 0: GOSUB 900
14586 X = 0: Y = -2: GOSUB 900
14588 GOSUB 944: X = INT(WID/2): Y = -30: GOSUB 900
14590 LPRINT ";: CC 0,12 "
14592 GOSUB 944: GOSUB 964
14594 GOTO 14947
14700 '
14701 ' *** TRASH COMPACTOR ***
14702 '
14703 CLS:PRINT " A TRASH COMPACTOR CAN BE 15 OR 24 INCHES WIDE.
     ENTER THE WIDTH YOU PREFER. ": INPUT WY: GOSUB 1000
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```
14704 WID = INT ( WY * 5 )
14706 WID = WID - 8: GOSUB 934
14708 X = WID: Y = 0 : GOSUB 900
14710 X = 0: Y = 184: GOSUB 900
14712 X = -WID: Y = 0 : GOSUB 900
14714 X = 0: Y = -184 : GOSUB 900
14716 GOSUB 944: Y = 190: X = -4 : GOSUB 900
14718 GOSUB 934: X = WID+4: Y = 0:  GOSUB 900
14720 GOSUB 944: Y = 25: X = -25: GOSUB 900
14722 LPRINT ";: CC 0,12 "
14724 GOSUB 944: X = -INT((WID/2)):Y = -50: GOSUB 900
14726 GOSUB 934: X = 50:Y = 0 :GOSUB 900
14728 X = 0: Y = 2:GOSUB 900
14730 X = -50 : Y = 0: GOSUB 900
14732 X = 0:Y = -2: GOSUB 900
14734 GOSUB 944: GOSUB 964
14736 GOTO 14947
14800 ' 4 DRAWER BASE **
14805 '
14807 GOSUB 1000
14810 WID = WID - 8 :GOSUB 934
14815 X = WID: Y = 0 : GOSUB 900
14820 X = 0: Y = 70:GOSUB 900
14825 X = -WID: Y = 0 : GOSUB 900
14830 X = 0 : Y = -70 :GOSUB 900
14835 GOSUB 944: X = 0 : Y = 74: GOSUB 900
14840 GOSUB 934: X = WID: Y = 0 : GOSUB 900
14845 X = 0 : Y = 65: GOSUB 900
14850 X = -WID: Y = 0 : GOSUB 900
14855 X = 0 : Y = -65: GOSUB 900
14860 GOSUB 944: X = 0: Y = 69: GOSUB 900
14865 GOSUB 934: X = WID: Y = 0 : GOSUB 900
14870 X = 0 : Y = 50: GOSUB 900
14875 X = -WID: Y = 0: GOSUB 900
14880 X = 0: Y = -50 : GOSUB 900
14885 GOSUB 944: X = 0: Y = 54: GOSUB 900:GOSUB 934
14890 X = WID: Y = 0 : GOSUB 900
14895 X = 0: Y = 50 : GOSUB 900
14900 X = -WID : Y = 0 : GOSUB 900
14905 X = 0 : Y = -50 : GOSUB 900
14910 GOSUB 944: X = INT(WID/2):Y = 25: GOSUB 900
14915 GOSUB 974: GOSUB 944
14920 Y = -54: X = 0 : GOSUB 900
14925 GOSUB 974: GOSUB 944
14930 Y = -61: X = 0: GOSUB 900
14935 GOSUB 974: GOSUB 944
14940 Y = -72: X = 0 :GOSUB 900
14945 GOSUB 974: GOSUB 944: GOSUB 964
14947 X=-WID: Y=-60: GOSUB 900
14950 DD$ = "B 4D"
14952 IF TY = 6 THEN DD$ = " DW "
14954 IF TY = 7 THEN DD$ = " TC "
14956 LPRINT ";: S12"; + DD$
14958 LPRINT STR$(WY);CHR$(95)
14960 GOSUB  964
14962 LPRINT "U A 0,0"
14964 RETURN
15000 '
15005 ' ****** OVEN AND STORAGE ROUTINES ****
```

```
15010 '
15015 OF = 0
15020 OW = INT(S*WY):OH=INT(84*S):GOSUB 934
15025 X=OW: Y=0: GOSUB 900: GOSUB 954
15030 X=0: Y=OH: GOSUB 900
15035 X=-OW: Y=0: GOSUB 900
15040 X=0: Y=-OH: GOSUB 900: GOSUB 944
15045 X=0: Y=33: GOSUB 900: GOSUB 934
15050 X=OW: Y=0: GOSUB 900: GOSUB 944
15055 IF TY= 20 THEN 15700 ' GO TO STORAGE ROUTINE ****
15060 IF WY<33 THEN GOTO 15500 '  GOTO ONE DOOR ROUTINE ***
15065 '
15070 ' ** 2 DOOR ROUTINE **
15075 '
15080 DW=INT((OW-14)/2)
15085 X=-4:Y=4:GOSUB 900: GOSUB 934
15090 DH=234: IF TY = 18 THEN DH=164
15095 X=0: Y=DH: GOSUB 900
15100 X=-DW: Y=0: GOSUB 900
15105 X=0: Y=-DH: GOSUB 900
15110 X=DW: Y=0: GOSUB 900: GOSUB 944
15115 X=-DW-6: Y=0:GOSUB 900: GOSUB 934
15120 X=0: Y=DH: GOSUB 900
15125 X=-DW: Y=0: GOSUB 900
15130 X=0: Y=-DH: GOSUB 900
15135 X=DW: Y=0: GOSUB 900: GOSUB 944
15140 X=-20: Y=DH-20: GOSUB 900: GOSUB 974: GOSUB 944
15145 X=46: Y=0: GOSUB 900: GOSUB 974: GOSUB 944
15150 X=-(26+DW): Y=35: GOSUB 900
15155 DH=200: IF TY=18 THEN DH = 175
15157 X=0: Y=4: GOSUB 900
15160 OD=OW-8: OF = OF + 1: GOSUB 934
15165 X=OD: Y=0: GOSUB 900
15170 X=0: Y=DH: GOSUB 900
15175 X=-OD: Y=0: GOSUB 900
15180 X=0: Y=-DH: GOSUB 900
15185 GOSUB 944
15190 GH=DH-30: GW=OD-8
15195 X=4: Y=4: GOSUB 900: GOSUB 934
15200 X=GW: Y=0: GOSUB 900
15205 X=0: Y=GH: GOSUB 900
15210 X=-GW: Y=0 :GOSUB 900
15215 X=0: Y=-GH: GOSUB 900: GOSUB 944
15220 X=INT((GW/2)-25): Y=GH-15: GOSUB 900: GOSUB 934
15225 X=50: Y=0: GOSUB 900
15230 X=0: Y=2: GOSUB 900
15235 X=-50: Y=0: GOSUB 900
15240 X=0: Y=-2: GOSUB 900
15245 GOSUB 944
15255 X=-INT(GW/2)+23: Y=60: GOSUB 900
15258 IF OF = 2 THEN 15270
15260 IF TY = 17 THEN 15270
15265 DH=125: IF OF < 2 THEN 15160
15270 GOSUB 944: GOSUB 964
15275 Y=501: X=-OW+4
15280 IF TY=18 THEN Y=546
15285 GOSUB 900
```

```
15290 '            ***** TOP CABINETS ***
15295 DH= 195: IF TY = 18 THEN DH=150
15300 GOSUB 934: X=DW: Y=0: GOSUB 900
15305 X=0: Y=DH: GOSUB 900
15310 X=-DW: Y=0: GOSUB 900
15315 X=0: Y=-DH: GOSUB 900: GOSUB 944
15318 IF WY < 33 THEN 15600
15320 X=DW+6: Y=0: GOSUB 900: GOSUB 934
15325 X=DW: Y=0: GOSUB 900
15330 X=0:Y=DH: GOSUB 900
15335 X=-DW: Y=0: GOSUB 900
15340 X=0: Y=-DH: GOSUB 900: GOSUB 944
15345 X=20: Y=20  : GOSUB 900
15350 GOSUB 974: GOSUB 944
15355 X=-46: Y=0: GOSUB 900
15360 GOSUB 974: GOSUB 944
15365 GOSUB 964
15380 GOSUB 964
15385 GOTO 15850
15500 '
15505 ' ****  ONE DOOR OVEN CABINET ROUTINE  ****
15510 '
15515 DW=OW-8: DH=234
15520 IF TY = 18 THEN DH = 164
15525 X=-4: Y=4: GOSUB 900: GOSUB 934
15530 X=0:Y=DH: GOSUB 900
15535 X=-DW: Y=0: GOSUB 900
15540 X=0: Y=-DH: GOSUB 900
15545 X=DW: Y=0: GOSUB 900: GOSUB 944 ' FINISH LOWER DOOR
15550 CLS:PRINT "DO YOU WANT THE KNOBS ON THE LEFT (L) OR RIGHT
      (R) OF THE CABINET DOORS ? "
15555 K$ = INKEY$: IF K$ = "" THEN 15555
15557 IF TY = 20 THEN 15730
15560 IF K$ = "R" THEN 15575
15565 IF K$ = "L" THEN 15585
15570 GOTO 15555
15575 X=-20: Y=DH-20: GOSUB 900: GOSUB 974
15580 GOSUB 944: X=-(DW-20): Y=35: GOSUB 900: GOSUB 934:
      GOTO 15155
15585 X=-(DW-20): Y=DH-20: GOSUB 900: GOSUB 974
15590 GOSUB 944: X=-20: Y=35: GOSUB 900: GOSUB 934
15595 GOTO 15155 '  ** GO DRAW OVEN DOORS **
15600 IF K$="R" THEN X=DW-20
15605 IF K$="L" THEN X=20
15610 Y=20: GOSUB 900: GOSUB 974: GOSUB 944
15615 IF K$ = "R" THEN X=20
15620 IF K$ = "L" THEN X=DW-20
15625 Y=DH-5: GOSUB 900
15630  GOSUB 944: GOSUB 964
15635 GOTO 15850
15700 '
15705 ' *** STORAGE ROUTINE ***
15710 '
15715 DW = OW - 8: DH = 500
15720 GOTO 15525 ' GO DRAW LOWER DOOR *****
15725 ' *
15730 IF K$ = "R" THEN 15745
15735 IF K$ = "L" THEN 15751
```

```
15740 GOTO 15555
15745 X=-20: Y=400: GOSUB 900: GOSUB 974: GOSUB 944
15750 X=-DW+20: Y=106: GOSUB 900: GOSUB 934: GOTO 15755
15751 X=-DW+20: Y=400: GOSUB 900: GOSUB 974: GOSUB 944
15753 X=-20: Y=106: GOSUB 900: GOSUB 934
15755 X=DW: Y=0 : GOSUB 900
15760 X=0: Y=153: GOSUB 900
15765 X=-DW: Y=0: GOSUB 900
15770 X=0: Y=-153: GOSUB 900
15775 IF K$ = "L" THEN 15790
15780 X=DW-20: Y=20: GOSUB 944: GOSUB 900
15785 GOSUB 974: GOSUB 944: X=20: Y=152: GOSUB 900: GOTO 15800
15790 X=20: Y=20: GOSUB 944: GOSUB 900
15795 GOSUB 974: GOSUB 944: X=DW-20: Y=152: GOSUB 900
15800 GOSUB 944: GOSUB 964
15849 '
15850 ' OVEN AND STORAGE LABEL ROUTINE
15855 '
15860 X=-OW: Y=-65: GOSUB 900
15865 LB$ = " O."
15870 IF TY =18 THEN LB$ = " DBL.O."
15875 IF TY = 20 THEN LB$ = " ST."
15880 LPRINT ";: S12";+LB$
15885 LPRINT STR$(WY);CHR$(95)
15890 GOSUB 964
15895 LPRINT "U A 0,0"
15900 RETURN
16000 '
16005 ' *** WALL CABINET WITH HOOD  ***
16010 '
16015 HT=12: GOSUB 13015
16020 GOSUB 944: X=0: Y = -YW-5: GOSUB 900
16025 GOSUB 934
16030 X=0: Y=-60: GOSUB 900
16035 X=-XW: Y=0: GOSUB 900
16040 X=0: Y=60: GOSUB 900
16045 X=30: Y=-35: GOSUB 900
16050 X=0: Y=-25: GOSUB 900
16055 X=0: Y=25 : GOSUB 900
16060 X=XW-60: Y=0: GOSUB 900
16065 X=0: Y=-25: GOSUB 900
16070 X=0: Y=25: GOSUB 900
16075 X=30: Y=35: GOSUB 900: GOSUB 944: GOSUB 964
16078 GOSUB 13328
16085 RETURN
16100 '
16105 ' **** ROTATING CORNER BASE CABINETS ****
16110 '
16115 WY=WY-24
16120 IF TY = 12 THEN 13540
16125 XW=INT(12*S): XH=288: GOSUB 934
16130 X=XW: Y=0: GOSUB 900
16135 GOSUB 954
16140 X=0: Y=XH: GOSUB 900
16145 X=-XW: Y=0 : GOSUB 900
16150 X=0: Y=-XH: GOSUB 900: GOSUB 944
16155 X=0: Y=300: GOSUB 900: GOSUB 934
```

```
16160 X=XW: Y=0: GOSUB 900: GOSUB 944: GOSUB 964
16165 X=0: Y=33: GOSUB 900: GOSUB 934
16170 X=-XW: Y=0: GOSUB 900: GOSUB 944
16175 X=4: Y=4: GOSUB 900: GOSUB 934
16180 XW=XW-8: XH=XH-41
16185 X=XW: Y= 0: GOSUB 900
16190 X=0: Y=XH: GOSUB 900
16195 X=-XW: Y=0: GOSUB 900
16200 X=0: Y=-XH: GOSUB 900: GOSUB 944
16205 X=20: Y=195   : IF TY = 12 THEN X = XW-20
16210 GOSUB 900: GOSUB 974: GOSUB 944: GOSUB 964
16215 IF TY = 12 THEN RETURN
16220 GOTO 13540
16300 '
16305 ' **** DESK ROUTINE ****
16310 '
16315 DW=288: DH=INT(WY*S)
16320 X=0 :Y=DW: GOSUB 934 : GOSUB 900
16325 X=DH: Y=0: GOSUB 900
16326 GOSUB 944: X=0:Y=12: GOSUB 900: GOSUB 934: X=-DH: Y=0:
      GOSUB 900: GOSUB 944:X=DH: Y=-12:GOSUB 900: GOSUB 934
16330 X=0: Y=-62: GOSUB 900
16335 X=-DH: Y=0: GOSUB 900: GOSUB 944
16340 X=6: Y=6: GOSUB 900: GOSUB 934
16345 DR=DH-12: DU=50
16350 X=0: Y=DU: GOSUB 900
16355 X=DR: Y=0:GOSUB 900
16360 X=0: Y=-DU: GOSUB 900
16365 X=-DR: Y=0: GOSUB 900: GOSUB 944
16370 X=INT(DR/2): Y=25: GOSUB 900
16375 GOSUB 974: GOSUB 944
16380 X=-INT(DR/2): Y=-31: GOSUB 900: GOSUB 934
16385 X=0: Y=-(DW-62): GOSUB 900
16390 X=-6: Y=0 : GOSUB 900: GOSUB 944
16395 X=DH-8: Y=0: GOSUB 900: GOSUB 934
16400 X=0: Y=DW-62: GOSUB 900
16405 X=6: Y=0: GOSUB 900
16410 X=0: Y=-(DW-62): GOSUB 900: GOSUB 954
16415 X=-6: Y=0: GOSUB 900: GOSUB 944
16420 X=-(DH-20): Y=-63: GOSUB 900
16425 BL$=" DESK"
16430 LPRINT" ;: S12";+BL$
16435 LPRINT STR$(WY);CHR$(95)
16440 GOSUB 944: GOSUB 964
16445 RETURN
16500 '
16505 ' ****  FURRED CEILING  ****
16510 '
16515 GOSUB 944
16517 LPRINT" ;: A H 100,400 R "
16520 X = 0: Y = 712
16522 XS = INT ( XX * S )
16525 GOSUB 900: GOSUB 934
16530 X = XS: Y = 0: GOSUB 900
16535 GOSUB 944: GOSUB 964
16540 RETURN
```

```
10 '               SCHOOL SHOP INVENTORY AND ACCOUNTS
15 '
20 '  USE THIS PROGRAM TO MAINTAIN AN ACCOUNT OF THE MATERIALS
25 'ON HAND AND HOW MUCH MONEY  EACH STUDENT (ACCOUNT) HAS ON
30 'HIS OR HER BILL.  THERE ARE PROVISIONS FOR CHANGING ALL
35 'DATA, INCLUDING COSTS OF MATERIAL, MATERIAL ON HAND,
40 'ACCOUNTS, AND ACTUAL BILL AMOUNTS.  THE DATA IS STORED ON
45 'DISK UPON EXIT FROM THE PROGRAM.
50 '
55 '
60 CLEAR 3000
65 DIM N(1)                         '  FILE OVERHEAD
70 DIM FI$(49,2)                    '  NAMES,DESCRIPTIONS,UNITS
75 DIM MI(49,2)                     '  BILLS,INVENTORY,PRICES
80 '
85 '
90 '      *** FILE READ ROUTINE ***
95 '
100 ON ERROR GOTO 500
105 OPEN"I",1,"SHOP/DAT"
110 INPUT#1,N(0)
111 INPUT#1,N(1)
112 IF N(0) = 0 THEN 5900
115 FOR I = 0 TO N(0) - 1
120   INPUT#1,FI$(I,0)
125   INPUT#1,MI(I,0):NEXT I
129 '
130 FOR I = 0 TO N(1) - 1
135   INPUT#1,FI$(I,1)
137   INPUT#1,FI$(I,2)
139   INPUT#1,MI(I,1)
141   INPUT#1,MI(I,2):NEXT I
145 CLOSE
500 '
510 '       *** MAIN MENU ***
520 '
530 ON ERROR GOTO 8030
540 CLS:PRINT@139,"   SCHOOL SHOP INVENTORY":PRINT
550 PRINT"   ENTER THE NUMBER OF THE DESIRED ACTION.'
560 PRINT"           1. REQUEST FOR MATERIALS"
570 PRINT"           2. CHARGE FOR UNINVENTORIED MATERIALS"
580 PRINT"           3. INSPECT INVENTORY TOTALS"
590 PRINT"           4. INSPECT ACCOUNTS"
600 PRINT"           5. CORRECTIONS"
610 PRINT"           6. NEW ACCOUNTS"
620 PRINT"           7. NEW STOCK"
630 PRINT"           8. EXIT"
640 '
650 INPUT C
660 IF C < 1 OR C > 8 THEN 660
670 ON C GOTO 1000,2000,3000,4000,5000,6000,7000,8000
680 '
690 '
1000 '
```

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```
1010 '     *** REQUEST FOR MATERIAL ***
1020 '
1030 CLS:PRINT@20,"MATERIAL REQUISITION"
1040 PRINT@132,"PRESS"
1050 PRINT"       B TO SEE PREVIOUS MATERIAL."
1060 PRINT"       N TO SEE NEXT MATERIAL."
1070 PRINT"       A IF DISPLAYED MATERIAL IS ONE REQUESTED."
1080 PRINT"       E TO RETURN TO MAIN MENU."
1090 '
```

```
1100 PRINT@512,"      MATERIAL     AMOUNT IN STOCK    PRICE PER UNIT"
1110 C = 0
1120 '
1130 PRINT@640,"
1140 PRINT@640,FI$(C,1);TAB(25);MI(C,1);FI$(C,2);TAB(50);MI(C,2)
1150 A$ = INKEY$:IF A$ <> "B" AND A$ <> "N" AND A$ <> "A" AND A$
     <> "E" THEN 1150
1160   IF A$ = "E" THEN 500              ' RETURN TO MAIN MENU
1170   IF A$ = "A" THEN 1220             ' REQUEST MATERIAL
1180 IF A$ <> "N" THEN 1190
1182   C = C + 1:IF C > N(1)-1 THEN C = 0
1184   GOTO 1130
1190 C = C - 1:IF C < 0 THEN C = N(1)-1
1195 GOTO 1130
1200 'END DISPLAY LOOP
1210 '
1220 FOR I = 128 TO 384 STEP 64
1230   PRINT@I,"                                                               "
1240 NEXT I
1250 PRINT@139,"HOW MANY ";FI$(C,2);" OF ";FI$(C,1);" DO YOU WANT?"
1260 INPUT M
1270 IF M < MI(C,1) THEN 1310       ' CHECK IF ENOUGH IN STOCK
1280 PRINT"  THERE ISN'T THAT MUCH IN STOCK."
1290 FOR I = 1 TO 500:NEXT I: GOTO 1220
1300 '
1310 GOSUB 1900                       ' GET AND CHECK ACCOUNT NAME
1320 IF FL = 1 THEN 500               ' FL=1 IS WRONG ACCOUNT NAME
1330 '
1340 S = M * MI(C,2)                  ' FIGURE COSTS
1350 MI(NA,0) = MI(NA,0) + S          ' CHARGE TO BILL
1360 MI(C,1) = MI(C,1) - M            ' DEDUCT FROM INVENTORY
1370 '
1380 CLS:PRINT@128,FI$(NA,0);" CHARGED ";S;" FOR ";M;FI$(C,2);" OF
     ";FI$(C,1);"."
1390 PRINT@331,"PRESS C TO CONTINUE"
1400 A$ = INKEY$:IF A$ <> "C" THEN 1400
1410 GOTO 500                         ' RETURN TO MAIN MENU
1420 '
1430 '
1900 '
1910 '    *** ACCOUNT NAME CHECK ROUTINE ***
1920 '
1930 CN = 0: FL = 0
1935 CLS:PRINT@139,"ACCOUNT NAME?"
1940 INPUT A$
1945 NA = 0
1950 IF A$ = FI$(NA,0)  THEN 1995
1955 NA = NA + 1: IF NA > N(0) THEN 1965
1960 GOTO 1950
1965 PRINT@395,"NAME NOT RECOGNIZED."
1970 FOR I = 1 TO 500:NEXTI
1975 CN = CN + 1: IF CN > 3 THEN FL = 1 :GOTO 1995
1980 GOTO 1935
1995 RETURN
2000 '
```

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```
2010 '      *** CHARGE FOR UNINVENTORIED MATERIAL ***
2020 '
2030 CLS:PRINT@11,"CHARGE FOR UNINVENTORIED MATERIAL"
2040 FOR I = 1 TO 500:NEXT I
2050 GOSUB 1900
2060 IF FL = 1 THEN 500          ' RETURN IF NAME NOT RECOGNIZED
2070 CLS:PRINT@200,"HOW MUCH IS ";FI$(NA,0);" TO BE CHARGED?"
2080 INPUT S
2090 MI(NA,0) = MI(NA,0) + S
2100 PRINT@400,FI$(NA,0);" NOW OWES ";MI(NA,0)
2110 '
2120 PRINT@775,"PRESS C TO CONTINUE."
2130 A$ = INKEY$:IF A$ <> "C" THEN 2130
```

```
1100 PRINT@512,"     MATERIAL     AMOUNT IN STOCK   PRICE PER UNIT"
1110 C = 0
1120 '
1130 PRINT@640,"
1140 PRINT@640,FI$(C,1);TAB(25);MI(C,1);FI$(C,2);TAB(50);MI(C,2)
1150 A$ = INKEY$:IF A$ <> "B" AND A$ <> "N" AND A$ <> "A" AND A$
     <> "E" THEN 1150
1160   IF A$ = "E" THEN 500          ' RETURN TO MAIN MENU
1170   IF A$ = "A" THEN 1220         ' REQUEST MATERIAL
1180 IF A$ <> "N" THEN 1190
1182   C = C + 1:IF C > N(1)-1 THEN C = 0
1184   GOTO 1130
1190 C = C - 1:IF C < 0 THEN C = N(1)-1
1195 GOTO 1130
1200 'END DISPLAY LOOP
1210 '
1220 FOR I = 128 TO 384 STEP 64
1230   PRINT@I,"                                                    "
1240 NEXT I
1250 PRINT@139,"HOW MANY ";FI$(C,2);" OF ";FI$(C,1);" DO YOU WANT?"
1260 INPUT M
1270 IF M < MI(C,1) THEN 1310        ' CHECK IF ENOUGH IN STOCK
1280 PRINT"  THERE ISN'T THAT MUCH IN STOCK."
1290 FOR I = 1 TO 500:NEXT I: GOTO 1220
1300 '
1310 GOSUB 1900                      ' GET AND CHECK ACCOUNT NAME
1320 IF FL = 1 THEN 500              ' FL=1 IS WRONG ACCOUNT NAME
1330 '
1340 S = M * MI(C,2)                 ' FIGURE COSTS
1350 MI(NA,0) = MI(NA,0) + S         ' CHARGE TO BILL
1360 MI(C,1) = MI(C,1) - M           ' DEDUCT FROM INVENTORY
1370 '
1380 CLS:PRINT@128,FI$(NA,0);" CHARGED ";S;" FOR ";M;FI$(C,2);" OF
     ";FI$(C,1);"."
1390 PRINT@331,"PRESS C TO CONTINUE"
1400 A$ = INKEY$:IF A$ <> "C" THEN 1400
1410 GOTO 500                        ' RETURN TO MAIN MENU
1420 '
1430 '
1900 '
1910 '    *** ACCOUNT NAME CHECK ROUTINE ***
1920 '
1930 CN = 0: FL = 0
1935 CLS:PRINT@139,"ACCOUNT NAME?"
1940 INPUT A$
1945 NA = 0
1950 IF A$ = FI$(NA,0)  THEN 1995
1955 NA = NA + 1: IF NA > N(0) THEN 1965
1960 GOTO 1950
1965 PRINT@395,"NAME NOT RECOGNIZED."
1970 FOR I = 1 TO 500:NEXTI
1975 CN = CN + 1: IF CN > 3 THEN FL = 1 :GOTO 1995
1980 GOTO 1935
1995 RETURN
2000 '
```

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```
2010 '     *** CHARGE FOR UNINVENTORIED MATERIAL ***
2020 '
2030 CLS:PRINT@11,"CHARGE FOR UNINVENTORIED MATERIAL."
2040 FOR I = 1 TO 500:NEXT I
2050 GOSUB 1900
2060 IF FL = 1 THEN 500          ' RETURN IF NAME NOT RECOGNIZED
2070 CLS:PRINT@200,"HOW MUCH IS ";FI$(NA,0);" TO BE CHARGED?"
2080 INPUT S
2090 MI(NA,0) = MI(NA,0) + S
2100 PRINT@400,FI$(NA,0);" NOW OWES ";MI(NA,0)
2110 '
2120 PRINT@775,"PRESS C TO CONTINUE."
2130 A$ = INKEY$:IF A$ <> "C" THEN 2130
```

```
2140 GOTO 500                ' RETURN TO MAIN MENU
2150 '
2160 '
3000 '
3010 '    *** INSPECT INVENTORY ***
3020 '
3030 CLS:PRINT@20,"INVENTORY INSPECTION"
3040 PRINT@132,"PRESS"
3050 PRINT"         B TO SEE PREVIOUS MATERIAL."
3060 PRINT"         N TO SEE NEXT MATERIAL."
3070 PRINT"         E TO RETURN TO MAIN MENU."
3080 '
3090 PRINT@512,"   MATERIAL    AMOUNT IN STOCK    PRICE PER UNIT"
3100 '
3110 C = 0
3120 PRINT@640,"
3130 PRINT@640,FI$(C,1);TAB(25);MI(C,1);FI$(C,2);TAB(50);MI(C,2)
3140 A$ = INKEY$:IF A$ <> "B" AND A$ <> "N" AND A$ <> "E" THEN3140
3150 IF A$ = "E" THEN 500          ' RETURN TO MAIN MENU
3160 IF A$ <> "B" THEN 3180
3162   C = C - 1:IF C < 0 THEN C = N(1)-1
3164   GOTO 3120
3180 C = C + 1:IF C > N(1)-1 THEN C = 0
3182 GOTO 3120
3190 '
3200 '
4000 '
4010 '    *** INSPECT ACCOUNTS ***
4020 '
4030 S = 0
4040 FOR I = 0 TO N(0)
4050   S = S + MI(I,0)             ' SUM TOTAL BILLS
4060 NEXT I
4070 '
4080 CLS:PRINT@21,"ACCOUNTS RECEIVABLE"
4090 PRINT@70,"TOTAL OF ALL ACCOUNTS IS $";S
4100 '
4110 PRINT@132,"PRESS"
4120 PRINT"          B TO SEE PREVIOUS ACCOUNT."
4130 PRINT"          N TO SEE NEXT ACCOUNT."
4140 PRINT"          E TO RETURN TO MAIN MENU."
4150 '
4160 PRINT@512,"      ACCOUNT        AMOUNT OWED "
4170 C = 0
4180 PRINT@640,"                                      "
4190   PRINT@640,TAB(5);FI$(C,0);TAB(30);"$";MI(C,0)
4200   A$ = INKEY$: IF A$ <> "B" AND A$ <> "N" AND A$ <> "E"
     THEN 4200
4210 '
4220   IF A$ = "E" THEN 500         ' RETURN TO MAIN MENU
4230 IF A$ <> "B" THEN 4245
4235    C = C - 1: IF C < 0 THEN C = N(0)-1
4240    GOTO 4180
4245 C = C + 1:IF C > N(0)-1 THEN C = 0
4250 GOTO 4180
4260 '
4270 '
5000 '
```

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```
5010 '     *** CORRECTIONS ***
5020 '
5030 CLS:PRINT@21,"CORRECTIONS"
5040 PRINT@132,"ENTER"
5050 PRINT"           1. TO CHANGE AN ACCOUNT NAME OR AMOUNT."
5060 PRINT"           2. TO CHANGE A MATERIAL DESCRIPTION,"
5070 PRINT"              UNIT OF MEASURE,INVENTORY AMOUNT OR"
5080 PRINT"              COST PER UNIT."
5090 '
```

```
5100 INPUT C
5110 IF C < 1 OR C > 2 THEN 5000
5120 ON C GOTO 5200,5600
5130 '
5200 GOSUB 5800                ' CLEAR WINDOW
5210 PRINT@132,"PRESS"
5220 PRINT"                 B TO SEE PREVIOUS ACCOUNT."
5230 PRINT"                 N TO SEE NEXT ACCOUNT."
5240 PRINT"                 A TO ALTER ACCOUNT SHOWN."
5250 PRINT"                 E TO RETURN TO MAIN MENU."
5260 '
5270 PRINT@512,"          ACCOUNT                   AMOUNT OWED"
5280 C = 0
5290 PRINT@640,"                                                     "
5300   PRINT@640,TAB(10);FI$(C,0);TAB(30);"$";MI(C,0)
5310   A$ = INKEY$:IF A$ <> "B" AND A$ <> "N" AND A$ <> "A" AND A$ <>
     "E" THEN 5310
5320 '
5330   IF A$ = "E" THEN GOTO 500        ' RETURN TO MAIN MENU
5340 IF A$ <> "B" THEN 5350
5342   C = C - 1:IF C < 0 THEN C = N(0)-1
5344   GOTO 5290
5350 IF A$ <> "N" THEN 5380
5351   C = C + 1:IF C > N(0)-1 THEN C = 0
5352 GOTO 5290
5360 '
5370 '   ALTER DATA
5380 GOSUB 5800
5390 PRINT@139,"CHANGE ACCOUNT NAME? (Y OR N)"
5400 A$ = INKEY$: IF A$ <> "Y" AND A$ <> "N" THEN 5400
5410 IF A$ = "N" THEN 5470
5420 PRINT@265,"NAME SHOULD BE?"
5430 INPUT FI$(C,0)
5440 '
5470 GOSUB 5800
5480 PRINT@139,"CHANGE AMOUNT OWED? (Y OR N)"
5490 A$ = INKEY$:IF A$ <> "Y" AND A$ <> "N" THEN 5490
5500 IF A$ = "N" THEN 5550
5510 PRINT@265,"AMOUNT SHOULD BE?"
5520 INPUT MI(C,0)
5550 GOTO 500                  RETURN TO MAIN MENU
5560 '
5600 '
5605 GOSUB 5800                ' CLEAR WINDOW
5610 PRINT@132,"PRESS"
5615 PRINT"               B TO SEE PREVIOUS DATA."
5620 PRINT"               N TO SEE NEXT DATA."
5625 PRINT"               A TO ALTER DATA SHOWN."
5630 PRINT"               E TO RETURN TO MAIN MENU."
5635 '
5640 PRINT@512,"     MATERIAL     UNIT OF MEASURE     PRICE PER UNIT"
5645 C = 0
5650 '
5655 PRINT@640,"
5660   PRINT@640,FI$(C,1);TAB(25);FI$(C,2);TAB(50);MI(C,2)
5665   A$ = INKEY$:IF A$ <> "B" AND A$ <> "N" AND A$ <> "A" AND A$
     <> "E" THEN 5665
5670 '
```

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```
5675   IF A$ = "E" THEN GOTO 500          ' RETURN TO MAIN MENU
5680 IF A$ <> "B" THEN 5685
5682   C = C - 1:IF C < 0 THEN C = N(1)-1
5683   GOTO 5655
5685 IF A$ <> "N" THEN 5695
5686   C = C + 1:IF C > N(1)-1 THEN C = 0
5687 GOTO 5655
5690 '
5695 GOSUB 5800                    'CLEAR WINDOW
5700 PRINT@139,"CHANGE MATERIAL DESCRIPTION? (Y OR N)"
5705 A$ = INKEY$:IF A$ <> "Y" AND A$ <> "N" THEN 5705
5710 IF A$ = "N" THEN 5725
5715 PRINT@265,"DESCRIPTION SHOULD BE?"
5720 INPUT FI$(C,1)
5725 GOSUB 5800                    ' CLEAR WINDOW
5730 PRINT@139,"CHANGE UNIT OF MEASURE? (Y OR N)"
5735 A$ = INKEY$:IF A$ <> "N" AND A$ <> "Y" THEN 5735
5740 IF A$ = "N" THEN 5760
5745 PRINT@265,"UNITS SHOULD BE?"
5750 INPUT FI$(C,2)
5755 '
5760 GOSUB 5800                    'CLEAR WINDOW
5765 PRINT@139,"CHANGE PRICE PER UNIT? (Y OR N)"
5770 A$ = INKEY$ :IF A$ <> "N" AND A$ <> "Y" THEN 5770
5775 IF A$ = "N" THEN GOTO 500      ' RETURN TO MAIN MENU
5780 PRINT@265,"PRICE PER UNIT SHOULD BE?"
5785 INPUT MI(C,2)
5790 GOTO 500              ' RETURN TO MAIN MENU
5795 '
5800 '
5810 '     *** CLEAR WINDOW ROUTINE ***
5820 '
5830 FOR I = 128 TO 448 STEP 64
5840   PRINT@I,"
5850 NEXT I
5860 RETURN
5870 '
5900 '
5910 '     *** FIRST USE START ***
5920 '
5930 ON ERROR GOTO  8150
5940 N(0) = 0 :N(1) = 0
5950 CLS:PRINT@139," SHOP INVENTORY":PRINT
5960 PRINT"    ENTER NEW ACCOUNT NAMES FIRST."
5970 FOR I = 1 TO 700 : NEXT I
5990 '
6000 CLS:PRINT@139,"NEW ACCOUNT NAME ENTRY"
6010 PRINT:PRINT"  HOW MANY NEW NAMES ARE TO BE ENTERED?"
6020 INPUT UN
6030 IF UN + N(0) > 50 THEN PRINT"TOO MANY":FOR I = 1 TO 500:
     NEXT I:GOTO 6000
6040 CLS:FOR I = N(0) TO N(0) + UN - 1
6050   PRINT@256,"INPUT NAME AND PRESS ENTER."
6060   INPUT FI$(I,0)
6070 NEXT I
6080 N(0) = N(0) + UN - 1
6090 CLS:PRINT"THERE ARE NOW";N(0)+1;"ACCOUNTS ON FILE."
6100 FOR I = 1 TO 500: NEXT I
6110 GOTO 500
7000 '       *** STOCK RECEIVED OR NEW STOCK ITEM ***
7010 '
```

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```
7020 CLS:PRINT@139,"ENTER"
7030 PRINT"        1. FOR ADDING TO EXISTING STOCK."
7040 PRINT"        2. FOR ADDING NEW STOCK ITEM."
7050 INPUT C
7060 '
7070 IF C < 1 OF C > 2 THEN 7000
7080 IF C = 2 THEN 7500
7090 '
7100 '   ADDING TO EXISTING STOCK
7110 '
7120 PRINT@139,"ADDING TO EXISTING STOCK"
7130 PRINT@260,"PRESS C TO CONTINUE TO STEP THROUGH THE EXISTING
     STOCK UNTIL THE MATERIAL RECEIVED APPEARS."
7140 PRINT"  PRESS A TO ADD TO THE DISPLAYED MATERIAL."
7150 '
7160 I = 0
7170 PRINT@460,I+1;"      ";FI$(I,1)
7180   A$ = INKEY$:IF A$ <> "A" AND A$ <> "C" THEN 7180
7190   IF A$ = "A" THEN GOTO 7250
7200   I = I + 1:IF I > N(1) THEN I = 0
7210   PRINT@460,"                                        "
7220 GOTO 7170
7230 '
7240 '
7250 CLS:PRINT@139,"ADDING STOCK TO";FI$(I,1)
7260 PRINT@260,"HOW MANY";FI$(I,2);"HAVE BEEN RECEIVED?"
7270 INPUT UN
7280 MI(I,1) = MI(I,1) + UN
7290 GOTO 500                    ' RETURN TO MAIN MENU
7300 '
7310 '
7500 '
7510 '     *** INPUT NEW TYPES OF MATERIAL ***
7520 '
7530 CLS:PRINT@139,"HOW MANY NEW TYPES OF MATERIAL ARE TO BE ENTERED?"
7540 INPUT UN
7550 IF UN + N(1) > 49 THEN PRINT"TOO MANY":FOR I = 1 TO 500:
     NEXT I:GOTO 7500
7560 CLS
7570 FOR I = N(1) TO N(1) + UN - 1
7580   CLS:PRINT@139,"INPUT MATERIAL DESCRIPTION (20 CHARACTERS OR
     LESS)."
7590   INPUT FI$(I,1)
7600 '
7610   PRINT@266,"INPUT UNIT OF MEASURE FOR ";FI$(I,1)
7620   INPUT FI$(I,2)
7630 '
7640   PRINT@390,"HOW MANY ";FI$(I,2);" HAVE BEEN RECEIVED?"
7650   INPUT MI(I,1)
7660 '
7670   PRINT@512,"INPUT THE PRICE PER ";FI$(I,2)
7680   INPUT MI(I,2)
7690 '
7700   PRINT@192,"                                "
7710   PRINT@290,"                                "
7720   PRINT@350,"                                "
7730   PRINT@560,"                                "
7740   PRINT@606,"                                "
```

```
7750 NEXT I                          ' RETURN TO MAIN MENU
7760 '
7770 N(1) = N(1) + UN - 1
7780 CLS:PRINT@139,"THERE ARE NOW";N(1);"DIFFERENT MATERIALS."
7790 FOR I = 1 TO 700:NEXT I
7800 GOTO 500
8000 '
8010 '      *** EXIT AND DISK SAVE ROUTINE ***
8020 '
8030 OPEN"O",1,"SHOP/DAT"
8040 PRINT#1.N(0)
8045 PRINT#1,N(1)
8050 '
8060 FOR I = 0 TO N(0) -1
8070   PRINT#1,FI$(I,0)
8075   PRINT#1,MI(I,0):NEXT I
8080 '
8090 FOR I = 0 TO N(1) - 1
8100   PRINT#1,FI$(I,1)
8105   PRINT#1,FI$(I,2)
8110   PRINT#1,MI(I,1)
8115   PRINT#1,MI(I,2):NEXT I
8130 '
8140 CLOSE
8150 END
```

```
100  REM * MACHINE SHOP CALC *
110  REM *      F. MULLEN     *
120  REM *      TAIU 1984     *

130  HOME
140  PRINT  TAB( 11)"MACHINE SHOP CALC"
150  PRINT : PRINT : PRINT
160  PRINT : PRINT "(1) LATHE SPINDLE RPM"
170  PRINT : PRINT "(2) THREAD CUTTING"
180  PRINT : PRINT "(3) TAPER TURNING"
190  PRINT : PRINT "(4) SPUR GEARS"
200  PRINT : PRINT "(5) QUIT"
210  PRINT : PRINT : PRINT : PRINT
220  INPUT "ENTER # OF SELECTION: ";A$
230  A =  VAL (A$)
240  IF A < 1 OR A > 5 THEN 130
250  IF A = 5 THEN  HOME : END
260  ON A GOTO 300,500,800,1100

300  REM LATHE SPINDLE RPM
310  HOME
320  PRINT  TAB( 10)"LATHE SPINDLE RPM"
330  PRINT : PRINT
340  PRINT  TAB( 11)"       C.S. X 12"
350  PRINT  TAB( 11)"RPM = ---------"
360  PRINT  TAB( 11)"       DIA X PI"
370  PRINT : PRINT
380  PRINT "ENTER"
390  PRINT : PRINT : INPUT "CUTTING SPEED (FPM): ";CS
400  PRINT : INPUT "DIA. OF WORKPIECE: ";DIA
410  RPM = (CS * 12) / (DIA * 3.1416)
420  RPM =  INT (RPM + .5)
430  PRINT : PRINT : PRINT
440  PRINT "SET SPINDLE --> ";RPM;" RPM"
450  GOSUB 1700
460  GOTO 300

500  REM THREAD CUTTING
510  HOME
520  PRINT  TAB( 14)"THREAD CUTTING"
530  PRINT : PRINT : PRINT
540  PRINT "ENTER"
550  PRINT : INPUT "MAJOR DIAMETER: ";MD
560  PRINT : INPUT "THREADS PER INCH: ";TPI
570  P = 1 / TPI
580  TDS = MD - P
590  DT = .61343 * P
600  MND = MD - (2 * DT)
610  P = ( INT (P * 1000 + .5)) / 1000
620  TDS = ( INT (TDS * 1000 + .5)) / 1000
```

```
630  DT = ( INT (DT * 1000 + .5)) / 1000
640  MND = ( INT (MND * 1000 + .5)) / 1000
650  PRINT : PRINT
660  PRINT "PITCH -----------> ";P;" INCHES"
670  PRINT : PRINT "TAP DRILL SIZE --> ";TDS;" INCHES"
680  PRINT : PRINT "THREAD DEPTH ----> ";DT;" INCHES"
690  PRINT : PRINT "MINOR DIAMETER --> ";MND;" INCHES"
700  GOSUB 1700
710  GOTO 500

800  REM TAPER TURNING
810  HOME
820  PRINT  TAB( 13)"TAPER TURNING"
830  PRINT : PRINT
840  PRINT "ENTER"
850  PRINT : PRINT : INPUT "LENGTH OF TAPER: ";LT
860  PRINT : INPUT "LENGTH OF WORKPIECE: ";LW
870  IF LT > LW THEN  PRINT : PRINT "NOT POSSIBLE" CHR$ (7)
     : FOR Z = 1 TO 1000: NEXT : GOTO 800
880  PRINT : INPUT "LARGE DIAMETER: ";LD
890  PRINT : INPUT "SMALL DIAMETER: ";SD
900  IF SD > LD THEN  PRINT : PRINT "NOT POSSIBLE" CHR$ (7)
     : FOR Z = 1 TO 1000: NEXT : GOTO 800
910  TN = ((LD - SD) * .5) / LT
920  DG =  ATN (TN) * 57.2958
930  SC =  INT ((DG -  INT (DG)) * 60)
940  PRINT : PRINT
950  PRINT : PRINT "COMPOUND REST ------> "; INT (DG);
     " DEG. ";SC;" SEC."
960  DG = DG * 2
970  SC =  INT ((DG -  INT (DG)) * 60)
980  PRINT : PRINT "TAPER ATTACHMENT ---> "; INT (DG);
     " DEG. ";SC;" SEC."
990  LT = LT / 12:LW = LW / 12
1000  RT = (LD - SD) / LT
1010  SO = (RT * LW) / 2
1020  SO = ( INT (SO * 1000 + .5)) / 1000
1030  PRINT : PRINT "TAILSTK SETOVER ----> ";SO;" INCHES"
1040  GOSUB 1700
1050  GOTO 800

1100  REM SPUR GEARS
1110  HOME
1120  PRINT  TAB( 15)"SPUR GEARS"
1130  PRINT : PRINT : PRINT
1140  PRINT : PRINT : PRINT
1150  PRINT "(1) ONE GEAR"
1160  PRINT : PRINT "(2) GEAR & PINION"
1170  PRINT : PRINT
1180  PRINT : PRINT : INPUT "ENTER # OF SELECTION: ";A$
```

```
1190  A =  VAL (A$)
1200  IF A < 1 OR A > 2 THEN 1100
1210  ON A GOTO 1220,1390
1220  HOME
1230  PRINT  TAB( 15)"SPUR GEARS"
1240  PRINT : PRINT : PRINT
1250  PRINT "ENTER"
1260  PRINT : INPUT "NUMBER OF TEETH: ";NT
1270  PRINT : INPUT "DIAMETRAL PITCH: ";DP
1280  PD = NT / DP
1290  PD =  INT (PD * 1000 + .5) / 1000
1300  OD = (NT + 2) / DP
1310  OD =  INT (OD * 1000 + .5) / 1000
1320  WD = 2.157 / DP
1330  WD =  INT (WD * 1000 + .5) / 1000
1340  PRINT : PRINT : PRINT "PITCH DIA. -----> ";PD;" INCHES"
1350  PRINT : PRINT "OUTSIDE DIA. ---> ";OD;" INCHES"
1360  PRINT : PRINT "WHOLE DEPTH ----> ";WD;" INCHES"
1370  GOSUB 1700
1380  GOTO 1100
1390  HOME
1400  PRINT  TAB( 15)"SPUR GEARS"
1410  PRINT : PRINT
1420  PRINT "ENTER"
1430  PRINT : INPUT "NO OF TEETH (PINION): ";NP
1440  INPUT "                   (GEAR): ";NG
1450  IF NP > NG THEN  PRINT : PRINT "NOT POSSIBLE" CHR$ (7)
      : FOR Z = 1 TO 1000: NEXT : GOTO 1390
1460  PRINT : INPUT "DIAMETRAL PITCH: ";DP
1470  PP = NP / DP
1480  PP =  INT (PP * 1000 + .5) / 1000
1490  PG = NG / DP
1500  PG =  INT (PG * 1000 + .5) / 1000
1510  OP = (NP + 2) / DP
1520  OP =  INT (OP * 1000 + .5) / 1000
1530  OG = (NG + 2) / DP
1540  OG =  INT (OG * 1000 + .5) / 1000
1550  WD = 2.157 / DP
1560  WD =  INT (WD * 1000 + .5) / 1000
1570  CD = (PP + PG) / 2
1580  CD =  INT (CD * 1000 + .5) / 1000
1590  R =  INT ((NG / NP) * 100 + .5) / 100
1600  PRINT : PRINT "PITCH DIA. (PINION) ----> ";PP;" INCHES"
1610  PRINT "                   (GEAR) -----> ";PG;" INCHES"
1620  PRINT : PRINT "OUTSIDE DIA. (PINION) --> ";OP;" INCHES"
1630  PRINT "                     (GEAR) --> ";OG;" INCHES"
1640  PRINT : PRINT "WHOLE DEPTH -------------> ";WD;" INCHES"
1650  PRINT : PRINT "RATIO (GEAR/PINION) -----> ";R;":1"
1660  PRINT : PRINT "CENTER DISTANCE ---------> ";CD;" INCHES"
1670  GOSUB 1700
1680  GOTO 1100
1700  REM ANOTHER PROBLEM ?
1710  PRINT : PRINT : INPUT "ANOTHER PROBLEM (Y/N) ";A$
1720  IF  LEFT$ (A$,1) = "N" THEN 100
1730  RETURN
```

```
100  REM * LATHE SPINDLE RPM *
110  REM *     F. MULLEN     *
120  REM *     TAIU 1984     *

130  HOME
140  PRINT  TAB( 10)"LATHE SPINDLE RPM"
150  PRINT : PRINT
160  PRINT  TAB( 11)"      C.S. X 12"
170  PRINT  TAB( 11)"RPM = ----------"
180  PRINT  TAB( 11)"      DIA X PI"
190  PRINT : PRINT
200  PRINT "ENTER:"
210  PRINT : PRINT : INPUT "CUTTING SPEED (FPM): ";CS
220  PRINT : INPUT "DIA. OF WORKPIECE (IN.): ";DIA
230  RPM = (CS * 12) / (DIA * 3.1416)
240  RPM =  INT (RPM + .5)
250  PRINT : PRINT : PRINT
260  PRINT "SET SPINDLE --> ";RPM;" RPM"
270  PRINT : PRINT : INPUT "ANOTHER PROBLEM (Y/N) ";A$
280  IF  LEFT$ (A$,1) = "N" THEN  HOME : END
290  GOTO 130
```

```
100  REM * THREAD CUTTING *
110  REM *    F. MULLEN   *
120  REM *    TAIU 1984   *

130  HOME
140  PRINT  TAB( 14)"THREAD CUTTING"
150  PRINT : PRINT : PRINT
160  PRINT "ENTER DECIMAL VALUES:"
170  PRINT : PRINT : INPUT "MAJOR DIAMETER (IN.): ";MD
180  PRINT : INPUT "THREADS PER INCH: ";TPI
190  P = 1 / TPI
200  TDS = MD - P
210  DT = .61343 * P
220  MND = MD - (2 * DT)
230  P = ( INT (P * 1000 + .5)) / 1000
240  TDS = ( INT (TDS * 1000 + .5)) / 1000
250  DT = ( INT (DT * 1000 + .5)) / 1000
260  MND = ( INT (MND * 1000 + .5)) / 1000
270  PRINT : PRINT
280  PRINT "PITCH -----------> ";P;" INCHES"
290  PRINT : PRINT "TAP DRILL SIZE --> ";TDS;" INCHES"
300  PRINT : PRINT "THREAD DEPTH ----> ";DT;" INCHES"
310  PRINT : PRINT "MINOR DIAMETER --> ";MND;" INCHES"
320  PRINT : PRINT : INPUT "ANOTHER PROBLEM (Y/N) ";A$
330  IF  LEFT$ (A$,1) = "N" THEN  HOME : END
340  GOTO 130
```

```
100  REM * TAPER TURNING *
110  REM *   F. MULLEN   *
120  REM *   TAIU 1984   *

130  HOME
140  PRINT  TAB( 13)"TAPER TURNING"
150  PRINT : PRINT
160  PRINT "ENTER AS DECIMAL VALUES:"
170  PRINT : PRINT : INPUT "LENGTH OF TAPER: ";LT
180  PRINT : INPUT "LENGTH OF WORKPIECE: ";LW
190  IF LT > LW THEN  PRINT : PRINT "NOT POSSIBLE" CHR$ (7)
     : FOR Z = 1 TO 1000: NEXT : GOTO 130
200  PRINT : INPUT "LARGE DIAMETER: ";LD
210  PRINT : INPUT "SMALL DIAMETER: ";SD
220  IF SD > LD THEN  PRINT : PRINT "NOT POSSIBLE" CHR$ (7)
     : FOR Z = 1 TO 1000: NEXT : GOTO 130
230  TN = ((LD - SD) * .5) / LT
240  DG =  ATN (TN) * 57.2958
250  SC =  INT ((DG -  INT (DG)) * 60)
260  PRINT : PRINT
270  PRINT : PRINT "COMPOUND REST ------> "; INT (DG);
     " DEG. ";SC;" SEC."
280  DG = DG * 2
290  SC =  INT ((DG -  INT (DG)) * 60)
300  PRINT : PRINT "TAPER ATTACHMENT ---> "; INT (DG);
     " DEG. ";SC;" SEC."
310  LT = LT / 12:LW = LW / 12
320  RT = (LD - SD) / LT
330  SO = (RT * LW) / 2
340  SO = ( INT (SO * 1000 + .5)) / 1000
350  PRINT : PRINT "TAILSTK SETOVER ----> ";SO;" INCHES"
360  PRINT : PRINT : INPUT "ANOTHER PROBLEM (Y/N) ";A$
370  IF  LEFT$ (A$,1) = "N" THEN  HOME : END
380  GOTO 130
```

```
100  REM * SPUR GEARS *
110  REM *  F. MULLEN *
120  REM *  TAIU 1984 *

130  HOME
140  PRINT  TAB( 15)"SPUR GEARS"
150  PRINT : PRINT : PRINT
160  PRINT "GEAR MENU"
170  PRINT : PRINT
180  PRINT "(1) ONE GEAR"
190  PRINT : PRINT "(2) GEAR & PINION"
200  PRINT : PRINT
210  PRINT : PRINT : INPUT "ENTER # OF SELECTION: ";A$
220  A =  VAL (A$)
230  IF A < 1 OR A > 2 THEN 1100
240  ON A GOTO 250,500

250  REM ONE GEAR
260  HOME
270  PRINT  TAB( 15)"SINGLE GEAR"
280  PRINT : PRINT : PRINT
290  PRINT "ENTER"
300  PRINT : INPUT "NUMBER OF TEETH: ";NT
310  PRINT : INPUT "DIAMETRAL PITCH: ";DP
320  PD = NT / DP
330  PD =  INT (PD * 1000 + .5) / 1000
340  OD = (NT + 2) / DP
350  OD =  INT (OD * 1000 + .5) / 1000
360  WD = 2.157 / DP
370  WD =  INT (WD * 1000 + .5) / 1000
380  PRINT : PRINT : PRINT "PITCH DIA. ------> ";PD;" INCHES"
390  PRINT : PRINT "OUTSIDE DIA. ---> ";OD;" INCHES"
400  PRINT : PRINT "WHOLE DEPTH ----> ";WD;" INCHES"
410  GOTO 790

500  REM GEAR & PINION
510  HOME
520  PRINT  TAB( 13)"GEAR AND PINION"
530  PRINT : PRINT
540  PRINT "ENTER"
550  PRINT : INPUT "NO OF TEETH (PINION): ";NP
560  INPUT "                (GEAR): ";NG
570  IF NP > NG THEN  PRINT : PRINT "NOT POSSIBLE" CHR$ (7)
     : FOR Z = 1 TO 1000: NEXT : GOTO 500
580  PRINT : INPUT "DIAMETRAL PITCH: ";DP
590  PP = NP / DP
600  PP =  INT (PP * 1000 + .5) / 1000
610  PG = NG / DP
620  PG =  INT (PG * 1000 + .5) / 1000
630  OP = (NP + 2) / DP
```

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```
640  OP =  INT (OP * 1000 + .5) / 1000
650  OG = (NG + 2) / DP
660  OG =  INT (OG * 1000 + .5) / 1000
670  WD = 2.157 / DP
680  WD =  INT (WD * 1000 + .5) / 1000
690  CD = (PP + PG) / 2
700  CD =  INT (CD * 1000 + .5) / 1000
710  R =  INT ((NG / NP) * 100 + .5) / 100
720  PRINT : PRINT "PITCH DIA. (PINION) ----> ";PP;" INCHES"
730  PRINT "             (GEAR) ----> ";PG;" INCHES"
740  PRINT : PRINT "OUTSIDE DIA. (PINION) --> ";OP;" INCHES"
750  PRINT "               (GEAR) --> ";OG;" INCHES"
760  PRINT : PRINT "WHOLE DEPTH -------------> ";WD;" INCHES"
770  PRINT : PRINT "RATIO (GEAR/PINION) -----> ";R;":1"
780  PRINT : PRINT "CENTER DISTANCE ---------> ";CD;" INCHES"
790  PRINT : PRINT : INPUT "ANOTHER PROBLEM (Y/N) ";A$
800  IF  LEFT$ (A$,1) = "N" THEN  HOME : END
810  GOTO 130
```

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964: EXECUTIVE ORDERS 11246 and 11375; TITLE IX 1973 EDUCATION AMENDMENTS: REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulation by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs of activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

O